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THE PAMIRS AND THE SOURCE OF THE OXUS.*

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PART II.

To revert to my journey. Having marched down the Wakhan Pamir to Bozai Gumbaz †—where Captain Younghusband, after being visited in a friendly way by the Russians, and after having entertained them, was arrested by Colonel Yonoff in August, 1891, on the return of the latter from his excursion across the Indian frontier—I diverged to the north-east to visit the Chakmak Lake and the Little Pamir. In the valley between the lake and Bozai Gumbaz, which is half a mile wide at the bottom, and about 12 miles in length, the Sarhad branch of the Oxus meanders about with a very tortuous course in a bed 20 yards wide, through scenery that very fairly recalls that of a swampy Scotch moor. There is, however, a great deal of sand and stones and clay, and the ground sparkles with immense patches of saline efflorescence. The Sarhad branch is recruited by three or four streams which come down from gorges in the mountains on the north side of the valley, but which, at the time of my visit, were almost empty rills. As we ascend the valley, the ground becomes broken up into clay hills, and presently

* Paper read at the Royal Geographical Society, February 18, 1895. Map, p. 96. Continued from p. 54.

† Bozai Gumbaz, or the Tomb of Bozai, sometimes also and more strictly called Gumbaz-i-Bozai, is a conical mud cupola resting upon a square brick foundation, at a little distance above the confluence of the Sarhad and Wakhan streams. The Russians, in 1891, tried to set up a claim to its possession, on the ground that Boza or Bozai had been a Kokandian tax-gatherer, who was killed down there while in the service of his state. Investigation proved this story to be a myth, and Bozai to have been a small local chieftain, who was slain in a fight with the Kanjutis or Hunza freebooters fifty years ago. The elevation was determined by the Boundary Commission of 1895 as 12,880 feet.

we reach a sort of low plateau several feet higher than the river-bed, stretching for nearly 4 miles to the lake. It is bare and flattish on the top, and contains a small lake between 300 and 400 yards long, as well as several largish pools. This is the watershed between the Chakmak Lake, with its easterly drainage into the Aksu basin, and the westerly drainage of the Panja or Oxus valley. In the Russian map this low plateau is called the Andemania Pass.* It is not a pass at all, but a miniature plateau. There is no Andemania or Andemin Pass here, and the latter name has been correctly transferred on English maps—*e.g.* Mr. Littledale's R.G.S. map—to the Benderski Pass between the Little and Great Pamirs, on the further side of the Chakmak Lake, of which it is the native title.

Reaching the edge of the lake, whose waters glinted brightly in the sun, I followed its northern shore over ground that was alternately soft grass, spongy bog, and dry stones, towards the north-east extremity. There I found to my surprise that the main body of the lake, which is from 3½ to 4 miles in length, has an extension in its south-east corner, of which I have found no notice in previous descriptions. Through a channel a few hundred yards wide, the water spreads into a succession of bays or extensions, each of which looks like a separate lake, and which are relieved by promontories and islets. These protract the length of the lake proper for an additional 1½ to 2 miles. It is from the extremity of the easternmost of these bays that the Aksu river emerges, flowing in two or three channels with a slow current through a rushy bed about 30 to 40 yards wide. This is the source of the rival claimant to the parentage of the Oxus, of whose pretensions I have already disposed. From here the Aksu wanders down the Little Pamir, spreading out into marshy swamps and ill-defined lakelets, which on most maps appear as though they were a series of accurately determined lakes. On the other hand, there are two biggish sheets of water in the hills immediately above the easterly extension of the lake or archipelago which appear in no map, and which have no connection with the river or its swamps. From the source of the Aksu, the Little Pamir stretches away with an average breadth of from 2 to 3 miles in the direction of Aktash, a normal Pamir landscape, closed by a snowy mountain at the end of the vista. A domed Kirghiz *ziarat* stood out clearly to the north-east, but on no part of this Pamir did I observe any sign of habitation or of human life.

As regards the name of the lake, I have called it Chakmak, because that appeared to be the generally accepted local designation.† In some maps it has been written Chakmaktin. Gordon and Trotter called it Gaz

* Grombchevski in 1888 called it the Chilob (*i.e.* Chelap) or Andemanyn pass.

† The first mention that I have found of the name is in one of the routes by Mohammed Amin, in 1867. He calls it Chakmaklig. *Vide* Davies' 'Trade Report of N.W. Frontier,' Appendix IV. B.

or Oi Kul, *i.e.* in Turki "Goose Lake," which is a common title applied by the Kirghiz to any or all of the Pamir lakes. Regel, the Russian, is quite alone in applying the name Suman Kul. The Russian map names the series of swamps or lakelets further down the valley successively as Turdûnin Kul and Karadumer Kul. Lake Chakmak possesses yet additional names, for whereas English writers have frequently employed the title Little Pamir Lake, which is the Kul-i-Pamir-Khurd of the Wakhis, the natives have also described it to travellers as Durna Kul or Tourna Kul (which I suspect to be the same word as the Russian title just quoted), and as Barkat Yasin (explained by Gordon as meaning

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Burgut Nursi, *i.e.* the "Eagle's Place or Nest"). I believe myself that the last-named is the name rather of one of the neighbouring ravines; and the same applies to the name Chelap, which was also given to me, and has appeared in some maps as appertaining to the lake, but which seems to belong preferably to the district in which it is situated. Colonel Trotter gave the elevation of the lake as 13,200 feet; Captain Younghusband as 13,850 feet; Lord Dunmore's aneroid, which appears to have been uniformly as treacherous as was my own, made it 14,230 feet. The Boundary Commission of 1895 made the source of the Aksu 13,100 feet. The Mirza's figures in 1869, 13,300 feet, were therefore wonderfully near the mark.

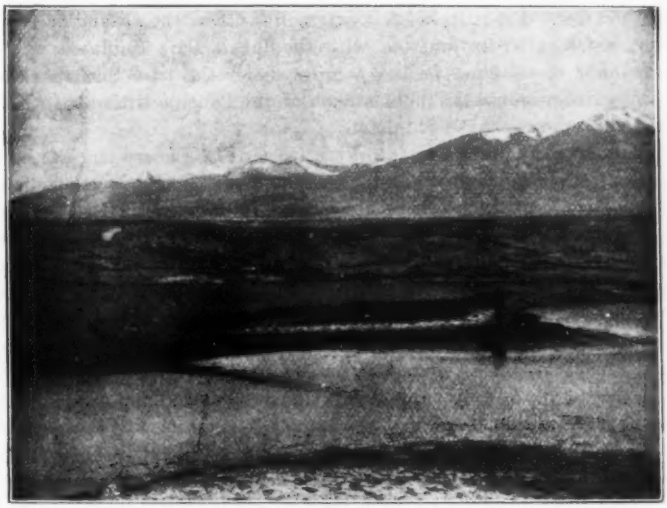
Pursuing the discussion of the hydrography of the Pamirs, I pass from this point to the next or Great Pamir, in order to make clear its

lake-system. The central feature is, of course, Wood's or Victoria Lake, from the western extremity of which the Panja flows. When Wood arrived at this lake in midwinter (February 19, 1838), land and water were equally covered with snow, and were almost indistinguishable from each other. He accordingly accepted the Kirghiz measurements of length and breadth, 14 miles by an average of 1 mile, checked so far as possible by his own vision. When Gordon and Trotter were there in April, 1874, the lake was similarly frozen over and snow-covered; but they estimated its dimensions as 10 miles by 3. Littledale, in June, 1890, found the lake still half sheeted with the previous winter's ice, but was much struck with its narrowness, which reminded him of a canal. Lord Dunmore, in November, 1892, gave its length as 9 to 10 miles in winter, and 12 miles in summer. The explanation of these varying figures is that, in common with all the Pamir lakes, Victoria Lake varies in size according to the season of the year, the normal dimensions being about 10 miles by 1½ mile, which are enlarged by the annual inundation of a larger area, consequent upon the melting of the summer snows. M. Benderski, however, the Russian topographer, who first saw the lake in 1883, and was attached to the Pamir Boundary Commission in 1895, told the English members of the latter that the lake had greatly diminished in size in the interval, and that he expected it finally to disappear. If the same process has been going on for centuries, we may perhaps find herein an explanation of the apparently extravagant dimensions assigned to the lake (assuming it to be identical with the Dragon Lake of legend) by the Chinese Buddhist pilgrims. As regards its elevation, Wood (whose instrument must have been defective) registered the height by boiling-point at 15,600 feet. Later measurements (Trotter, 13,900 feet; Littledale, 13,980 feet; Boundary Commission, 1895, 13,390 feet) have familiarized us with more modest figures. Touching the name of this lake, the title Victoria Lake, suggested rather than given to it by Wood, whose discovery coincided with the year following upon Her Majesty's accession, seems on the whole to have won most favour, at least with Englishmen. The alternative name of Sir-i-kol, which was mentioned to Wood by the Kara Kirghiz, has been very plausibly explained as referring to the station or camp at the "Head of the Lake;" although some have preferred Sarik or Sarigh-Kol, *i.e.* Yellow Lake. In the Anglo-Russian Pamir Agreement of March, 1895, the Russian name for the lake is given as Zor Kul. Faiz Bakhsh, the surveyor who was despatched to the Pamirs in 1870 by Sir D. Forsyth during the first Yarkand expedition, called the lake Hauz Kalan, *i.e.* Great Pool, or Kol-i-Sikandari, Alexander's Lake—a name which has been mentioned by no other traveller.* The former title is identical with the Kul-i-Kalan of Trotter and Gordon, which may either

* *Journal of the R.G.S.*, vol. xlii., 1872, p. 465.

signify literally the Great Lake, or be a contraction of the longer form Kul-i-Pamir-i-Kalan, *i.e.* Great Pamir Lake. The name Gaz Kul (Goose Lake) was given to Littledale as the common Kirghiz title; but I have already explained that this is a generic designation applied equally by the natives to any of the Pamir lakes.

A feature already noticed in the valley of the Chakmak Lake also holds good of the Victoria Lake basin, viz. the presence of a chain of smaller lakes in the immediate neighbourhood of and in connection with the main sheet of water. Two such small and frozen lakes were first observed by Gordon and Trotter in 1874, at a slight distance from the



LITTLE PAMIR AND AKSU RIVER.

upper or eastern end of Victoria Lake. Littledale calls one of these lakes, which is "some miles to the east" of the big lake, Aidin Kul. Lord Dunmore applies to one of the number the now familiar designation of Gaz Kul. The Russian map calls the more westerly of the two Lake Kurkuntai, a name which reappears on the Indian Intelligence map as Kuruntea. A further small sheet of water to the east, from which rises the Istik drainage, is called Lake Karadungi. At the eastern extremity of these lakelets is the watershed separating the Panja and Aksu drainages; and here the river Istik or Issik (erroneously called Isligh in Gordon's book) rises from several sources, and flows towards the Aksu, whence it joins at some distance below Aktash. The channel of one of the streams that flows from the watershed on the south into the eastern end of Victoria Lake also spreads out into three

small lakes at the bottom of the valley as it approaches the main sheet of water.

Similar conditions, on a larger scale, may be predicated of the hydrography of the next or Alichur Pamir. Here the lie of the lakes and the direction of the main drainage is again from east to west. The principal body of water is the Yeshil Kul (Green Lake), or Ishal Kul of Pundit Manphul and Isil-kol of Chinese records. This is the finest expanse of water in the Pamirs, being little liable to contraction, owing to its greater depth and more precipitous banks. It possesses a length of from 16 to 20 miles, and a breadth that varies, owing to the peculiar indentations of the shore, from 1 mile to 3 miles, and its elevation is 12,550 feet. From its western extremity issues the Ghund or Gunt river, which, after its junction with the Shakh Dara confluent of the Oxus lower down, flows for a few miles under the title Suchan Dara, and disembogues into the main stream of the Panja, a little above Kala Bar Panja, the capital of Shighnan.

A promontory projecting into Yeshil Kul at its eastern end has been the scene of a twofold historical tragedy, the earlier of which events is said to have been the origin of its name. In 1759, when the Chinese took possession of Kashgar, the two Kalmuk Khojas whom they expelled fled in an easterly direction across the Pamirs towards Badakshan. The Chinese general Fouteh, *i.e.* Fu or Ku Ta-jen, pursuing them by forced marches, came up with the fugitives at the east end of Yeshil Kul, attacked them by night, and inflicted upon them a defeat, from which, however, the Khojas and the bulk of their followers escaped with their lives.* Gordon was told in the Pamirs that they drove several of their women and children, mounted on camels and horses, into the lake, in order to avoid by drowning the worse fate that they anticipated at the enemy's hands, and that ever since sounds of lamentation have been heard to rise from the waters.† The Chinese general inscribed upon a stone a trilingual record in Chinese, Manchu, and Turki of his exploit, which remained there until recent years, when the Russians transported as much of it as remained to their museum at Tashkend. The place was thenceforward known as Soma Tash, which is explained as meaning Written Stone.‡

* *Vide* the interesting letter from two Jesuit priests at Kashgar dated November 26, 1759, and published in *Lettres Edifiantes*, xxxi. 248.

† 'Roof of the World,' p. 158.

‡ Lord Dunmore in his first map spelled it *Somur*. But in his book (vol. ii. p. 167) he substitutes for this *Surma*, which he says means "black." Now, *Surma* is a Persian word, signifying not "black," but "antimony" or "collyrium," the material used by the Persians for darkening the eyebrows and eyelids. A Persian word may conceivably have been joined with the Turki word *tash*, "stone," but the particular combination is more absurd than would be Rouge-hill for Redhill, in Surrey. I made many inquiries on the subject, but with no satisfactory results. The Kirghiz head-man of the Taghdumbash said the name was not Surma, but Suma Tash, and signified "written stone." On the other hand, the Hunza Wazir thought it was a word meaning "marsh-land" (cf. *su* = in Turki, "water").

The second incident of bloodshed with which the promontory of Soma Tash has been connected, happened less than three years ago. The Alichur Pamir and Yeshil Kul in particular had been for many years the more or less disputed boundary-line between the Afghan and Chinese spheres of jurisdiction on the Pamirs, when, in the early summer of 1891, Colonel Yonoff was despatched by the Russian Government with a body of troops, facetiously christened the Hunting Detachment, nominally in order to shoot *Ovis Poli*, and to indulge in rifle-practice on the Pamirs (of all places in the world!); really to execute a demonstration over the entire region, to turn out any Chinese or Afghan soldiers who might be found, and to anticipate the proposed diplomatic settlement of the dispute with England by forcible annexation. The Chinese, hearing of this movement, sent an officer with a small body of troops to assert their claims at Soma Tash. A gallant young English officer, Lieutenant Davison, who was travelling on his own responsibility in Chinese Turkestan at the time, and had been commissioned by Captain Younghusband from Kashgar to report upon what was passing in the Pamirs, was on the Alichur at the same juncture. Colonel Yonoff, arriving at Soma Tash, ordered the Chinese *Yangdarin* to withdraw, which command the latter with characteristic promptitude obeyed. Simultaneously he arrested Lieutenant Davison and sent him back, *viâ* the Alai and Marghilan, to Kashgar, an unwarrantable proceeding for which the Russian Government subsequently apologized. The Russians having in the mean time withdrawn, the Chinese again turned up at Soma Tash, and proceeded to build a fort. In the spring of 1892, however, the Afghans, who also claimed Soma Tash, appeared upon the scene, and the Chinese with docile rapidity a second time retired. Colonel Yonoff, however, was not to be foiled. In the summer of 1892 he repeated his military promenade of the previous year; ordered the Chinese to evacuate their armed posts on Lake Rang Kul and at Aktash (on the Aksu), which, of course, they did without a murmur; and, arriving at Soma Tash, essayed the same tactics with the Afghan outpost whom he found there installed. The Afghan commander, though hopelessly outnumbered, refused, and a conflict ensued on June 22, 1892, in which fifteen out of the seventeen Afghans present were slain. The Russians then again withdrew.

Just as in the cases of Lakes Chakmak and Victoria, so here at the eastern extremity of Yeshil Kul is a small subsidiary lake-basin, in the valley of the Alichur river, which contains no fewer than five lakes, scarcely as yet indicated on any map. They lie among the hollows and between "a sea of gravel mounds," the moraine-deposits of ancient glaciers. The nearest of these to Yeshil Kul is Bulun Kul,* which

* This must not be confounded with a second Bulun Kul, a lake which lies on the western side of the Gez defile, on the main line of connection between Kashgar and the northern Pamirs.

lies to the south of its eastern termination, and is connected with it by a stream only half a mile in length. Separated by a low watershed from this lake is another Gaz Kul, or Goose Lake. Next to this is Khargosh Kul, or Hare's Lake, so called because it lies below the Khargosh Dawan, or Hare's Pass, leading to the Great Pamir. This little lake is named Chukur Kul on the Russian Intelligence Map. The fourth in order to the east is Tuz Kul, or Salt Lake; and the fifth and last is Sassigh, or Sasik Kul* (*i.e.* Stinking or Fetid Lake), which is about 3 miles long by 1 broad.† Eastwards from this point the Alichur valley continues for a distance of 3 miles to Chatir, or Chadir Tash (Stone House), a solitary rock standing up in the valley-bottom, and presenting, at a distance, the appearance of a house.

The next Pamir lake-system to which, in our northerly progress, we come, is that of Rang Kul, lying in the hollow of the Pamir that bears the same name. This has been explained by Yule and others as signifying Ibex Lake (*rang* being the Turki word for the wild goat). Mr. Ney Elias, however, reported that the Turki-speaking Kirghiz use the Persian word *taka* for ibex (*cf.* the Min-taka pass before mentioned), and accordingly he preferred the Persian interpretation of *rang*, i.e. variegated, or of many colours.‡ I agree with this derivation, on the further ground that it is from their colour that several of the neighbouring lakes (*cf.* Kara Kul, or Black Lake; Yeshil Kul, or Green Lake; and possibly Sarik Kul, or Yellow Lake) are named. On the other hand, I have read that the Russians derive the name from a coarse sedge. Rang Kul was reported by Pundit Manphul, upon the information of Mohammed Amin, as lying in the Pamir Khurd, or Little Pamir §—a deception that greatly puzzled Yule and other geographers. As a matter of fact, it is situated in a north-east bay or extension of the valley of the Ak-baital (White Mare), which is the

* Colonel Yule, misled by the exaggerated dimensions given to these small lakes in earlier native itineraries or in Chinese geographies, and by the imperfect information existing in his time, went quite wrong over their identification. He thought, with Major Montgomerie, that Sasik Kul was Victoria Lake; that Pulong (*i.e.* Bulun) Kul was the imaginary Rang Kul of the Little Pamir; and that Tuz Kul was, possibly, Victoria Lake also (Introduction to Wood's 'Oxus,' pp. lxxxvi., lxxxvii.). Almost all the theoretical geographers, even the most distinguished, have been deceived by the fantastic exaggerations as to distance and measurement to which Oriental travellers invariably succumb.

† Abdul Mejid, in his northward march across the Pamirs to Kokand in 1861, mentions having passed two lakes, "at Khurgoshee and Kurreh Kol." The former he identifies in his itinerary with Sussugh Kul; the latter is the Great Kara Kul. His next march, after Kurreh Kol, is described as 15 miles in length, and as terminating at Dysame lake; but there can be little doubt that this is a misprint for the same lake, alluding to his day's march along its eastern shore.

‡ *Cf.* the well-known Karun river in south-west Persia, which is more strictly Kuran, or Kuh-rang, and is so called from the "variegated mountain" in which it takes its rise.

§ *Vide* Appendix to Davies' 'Trade Report of N.W. Frontier,' p. cccxxxiii.

LITTLE PAMIR, NEAR MIHMAN-GULI PASS.

northerly confluent—commonly dry in winter—of the Aksu, after its junction with which the latter river, flowing westwards, is called Murghab. Only in this remote sense—Ak-baital valley being a physical continuation of the Aksu valley, and the Aksu valley being a physical continuation of the Little Pamir—can the Rang Kul lake be said to have any connection with the Pamir-i-Khurd, from which it is really severed by a great distance. Its elevation is 12,250 feet above the sea.

This lake, however, like those already discussed, occupies a lacustrine basin, the sheets of water in which vary in size and configuration according to the season of the year. Severtsoff described it as consisting in reality of three separate basins and an extensive marsh, connected by narrow straits. The main lake has two divisions—Shor Kul on the west and Rang Kul on the east, which are usually so united. In the high waters of summer the two form one unbroken sheet. Lord Dunmore, passing on November 20, 1892, at the opposite extreme of season, found them entirely severed by a neck of land a quarter of a mile across, and unconnected, and erroneously declined to believe that they were ever united. In winter-time the upper or eastern lake, thus diminished, resembles a series of swamps, dotted with islands, whose banks are incrusted with a saline efflorescence. The entire lake-basin is about 20 miles long, and the normal length of the lakes is—Rang Kul 4 miles, and Shor Kul 6 miles. A remarkable feature of these lakes is that neither does any river discharge into them, nor is there any river-exit. Their waters must accordingly be largely recruited by subterranean drainage from the hills. Mr. Ney Elias, in 1885, said that the upper lake was considered to be fresh and the lower salt. Captain Younghusband, in 1890, reported the water as salt, and the colour as a beautiful clear blue. On the southern shore of Shor Kul is a peculiar rock, with a sheer front of 100 feet, which is known as Chiragh Tash or Lamp Rock, from a peculiar illusion produced by the sun's light penetrating through a cave or orifice that is pierced right through the rock. The natives attribute it to the eye of a dragon who is supposed to lurk in the cave. Captain Younghusband, in 1890, was the first to dissipate the mystery by clambering up and discovering the illusion which had puzzled Ney Elias in 1885.* At a little distance from the eastern extremity of Rang Kul is the fort which the Russians have built and garrisoned, since they expelled the Chinese from Rang Kul (which lay far inside the Chinese frontier) in 1892.

There remains but one more lake in the Pamir area, viz. the Great Kara Kul, which lies in the Khargosh or Hare Pamir, on the northern edge of the Pamir region, below the great Trans-Alai range. This is the most considerable body of water in the district, and has by some been identified with the Dragon Lake of local, and still more of Chinese

* *Proceedings of the R.G.S.*, vol. xiv., 1892, p. 227.

legend. Its dimensions have been absurdly exaggerated in the itineraries of mediæval pilgrims. Its extreme length from north to south is in reality 14½ miles, its breadth from east to west 11 miles, and its elevation above the sea is 12,800 feet. Like Rang Kul, it consists of two sheets of water united by a narrowish strait in the centre; or, as one may otherwise put it, of a single lake very nearly cut in twain by two promontories or sandy ridges projecting from the north and south shores. The curious thing about this lake is, that legend with singular unanimity has insisted at very varying periods upon a river discharge from it towards the west or south. At one time this discharge was supposed to be connected with the Surkhab or river of Karategin, at another with the Murghab or Bartang, at a third with the Aksu. And yet while several small torrents pour their waters into the lake, and one rather larger stream, the Chon-su, joins it from the Tuyuk or Ak-baital Pass on the south, there is no present efflux at all. The explanation appears to be, as Kostenko, its first European explorer in 1876, remarked, that the lake-level was once much higher than it is now, and that in those days it may have had a double discharge, both to the north and to the south. Severtsoff, indeed, said that even now, with a strong northerly wind blowing, the water of the lake will sometimes in flood-time be driven up the channel of the Chon-su, and then break out westwards in the direction of the Murghab; but this appears to be a very rare phenomenon, and the absence of modern outlet must be accepted as an established fact. The mountains approach closely to the lake and even project into it on its western side; at its eastern end they are nearly 7 miles distant, and hence the track from the north usually skirts that shore. The strongly indented coasts are carved into frequent promontories, and there is one island nearly 5 miles long. In stormy weather Kara Kul presents a splendid spectacle, for its waters toss and boil like a seething cauldron. Littledale, Younghusband, and Cumberland are the only Englishmen who have seen it.

Though lying in a different basin, and outside the Pamirs proper, I should, perhaps, not omit to notice the Little Kara Kul and its small lacustrine satellites, less for its own sake than on account of the two great mountain peaks which, at a distance of some 20 miles from each other, soar into the air on the north-east and the south-east borders of the lake, and which have given rise to much confusion among travellers and geographers. One of these peaks is visible from the plain of Yarkand and from Kashgar, whence it was roughly fixed, in 1868, by Hayward, and more accurately, in 1874, by Colonel Trotter, who gave its height as 25,350 feet. Both called it Tagharma, because the people said it was near to the place and plain of that name.* A little later, when

* *Taghar* is a Turki word signifying "a bag of grain"—an allusion to the fertility of the surrounding valley.

Trotter was in Sarikol, he saw from the southern side a different peak which was also called the Tagharma Peak. In 1871 Fedchenko, and in 1876 Kostenko, from the Kizil Art Pass, observed a great peak in this direction, the name of which was given to the latter as Mustagh Ata, *i.e.* Father of Ice Mountains. Maps and descriptions continued to confuse these separate mountains, usually representing them as one, until, in 1885, Mr. Ney Elias proved conclusively by his angles that they were distinct. The one to the north-east of Little Kara Kul is the mountain seen from Kashgar (from which it obscures the other), but is erroneously called Tagharma. He gave it the name Mount Dufferin, which appears in the Indian maps, but which, in a region lying so far outside of British-Indian influence, cannot, I think, be pressed. The Russian map calls it Mount Charkum. The second and southerly peak (which from Sarikol obscures the first) is the real Mustagh Ata, the height of which is probably a little less than its nameless brother, being calculated at about 25,000 feet, but which is a far finer mountain, since it is conical and comparatively isolated, whereas the more northerly mountain is the highest crest of an extended ridge. Even now the maps unanimously err in assigning to Mustagh Ata the altitude which appertains to its rival.

Several Russian explorers, notably Bogdanovitch in 1879 and Ivanoff in 1883, have made careful examination of Mustagh Ata, and during 1894, Dr. Sven Hedin, the Swedish traveller and scientist, made four unsuccessful attempts to climb it, reaching on one occasion to a height of 19,500 feet.* The summit, which is the central peak of three, is therefore still virgin, and is regarded by Hedin as almost inaccessible. The sides of this magnificent mountain are rent by deep gorges and filled with enormous glaciers.

Little Kara Kul, lying between them at a distance of about 50 miles due east from Rang Kul, has been formed by the moraines of a retreated glacier, which have dammed the valley. Glacier waters replenish it from the south, but its sole outlet is on the north into the upper course of the Gez stream, which flows towards Kashgar. A little below the point of discharge this stream receives from the north-west the drainage of a small chain of lakes in a separate basin, the lowest of which is called Basik Kul. Further down the Gez valley is the second Bulun Kul, which has already been mentioned.

From a description of the lake-system of the various Pamirs, I now turn to an account of the passes by which they are connected, and which I will trace in the inverse direction from north to south. I hope to have now sufficiently demonstrated that the Pamir region, in contradistinction to long-accepted beliefs, but in remarkable accordance with a prediction of Mr. Shaw,† consists of a series of elevated mountain valleys whose

* Vide *Geographical Journal*, vol. v., 1895, p. 154; and vol. vi. p. 250.

† *Vide* Yule's Introduction to Wood's 'Oxus,' p. lxxxix.

uniform direction is from east to west (with an occasional inclination from north-east to south-west),* which contract into gorges at their western extremities, where they become merged in the mountain systems of Roshan, Shighnan, and Wakhan; which are separated from each other by lofty parallel ridges whose normal trend is from east to west, directing the drainage into the Oxus basin; and which on the eastern side are fenced in and divided from the rival basin of Kashgar by a meridional range or ranges, sometimes included, in the mediæval itineraries and in the geographies based upon them, among the Tsung Ling, sometimes confounded with the obscure Bolor mountains,

DARKOT GLACIER.

and throwing up at one point the mighty pinnacles of Mustagh Ata, and its twin peak. To pass, therefore, from one Pamir to another by the shortest route, it is necessary to follow the transverse gorges or to climb the lower saddles of the intervening ridges. Of these passes there are many, even if we do not accept Ivanoff's interpretation of the native adage, "There are no roads on the Pamirs," as signifying that the Pamirs are everywhere traversable, which they certainly are not. I propose to indicate the principal and most easily accessible of these lines of communication.

* I except from this summary the Taghdumbash Pamir, which, I have previously shown, lies outside of the Pamirs proper, and is part of a different basin.

I. Passes on to the Northern Pamirs.

Upon the north, the base of any advance upon the Pamirs from the Russian province of Ferghana is either Osh or Marghilan. The former is the route almost invariably adopted both by military forces and by travellers. From Osh the route proceeds to Gulcha, and thence across the Little Alai range by the Taldik Pass (Littledale, 11,600 feet; Russian and Indian maps, 12,070 feet), or by the adjoining passes of Archat Dawan (11,900 feet) or Shart (12,800 feet), on to the Alai Plateau, or upper valley of the Surkh-ab or Kizil-su. Striking across this valley, we approach the Great or Trans-Alai range, and, crossing it by the Kizil Art Pass (14,260 feet), descend upon the Great Kara Kul (12,800 feet). The route skirts the east shore of the lake, and then takes one of two directions: either (1) a more easterly course, followed by M. Bonvalot's party in 1887, *viâ* the Karazak Pass, and Uzbel or Kizil-jik Pass (Indian map, 15,190 feet; Russian map, 15,300 feet), on to the Rang Kul Pamir and lake, and thence to the junction of the Ak-baital and Aksu at Murghabi; or (2) a more southerly course, taken by Littledale in 1890, up the Mus-kol or Chon-su confluent of Kara Kul to the Tuyuk or Ak-baital Pass (Russian map, 15,070 feet; Littledale, 15,525 feet), and thence down the Ak-baital stream to Murghabi, and the upper end of the Sarez Pamir.

The more westerly route to the northern Pamirs from Marghilan takes the following line: Uch Kurghan; up the Isfairam river; over the Little Alai range by the Tengiz Pass (11,800 feet) to Daraut Kurghan on the Kizil-su in the Alai Plateau; across the Great or Trans-Alai range by the Ters-agar or Altindi Pass (12,000 feet) to Altin Mazar; thence by the Takhta-koram Pass (15,480 feet) or Yengi Dawan (15,300 feet) on to the upper waters of the Kudara river, which can be followed down to their junction with the Murghab, or from which a shorter track can be taken more to the east over the Kara-bulak Pass (14,460 feet) to Kara-bulak on the Murghab.

II. Passes from the Murghab Valley and Sarez Pamir on to the Alichur Pamir and Yeshil Kul.

1. Starting from the Russian fort of Murghabi or Pamirski Poste, at the junction of the Aksu and Ak-baital streams, the route commonly followed ascends the Kara-su confluent of the Murghab, and crosses the low and flat-topped Neza Tash (*i.e.* Spear-stone) Pass (Indian map 13,650 feet; Littledale, 14,200 feet) to the headwaters of the Alichur river, which is then followed eastwards, past Chatir Tash to Yeshil Kul.

2. A little to the west of this route is a tract that was followed from Murghabi by Putiata in 1883. It crosses the dividing range by the Buz-tere Pass (14,900 feet), and also debouches on the upper waters of the Alichur river.

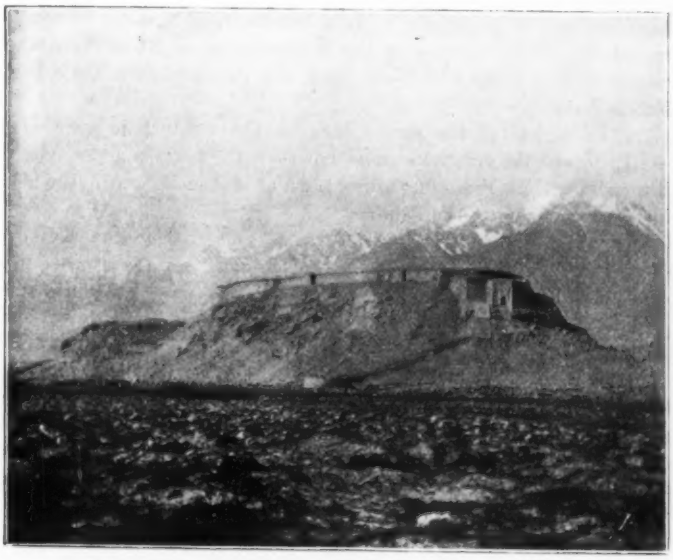
3. Immediately to the west of this again is a pass called Agal-khar.

4. From this point the northern boundary range of the Alichur Valley and Pamir is not again pierced by a traversable route until we come to the Marchenai Pass (15,700 feet), leading down from Sarez on the Murghab to the northern shore of Yeshil Kul.

5. To the west of this, the Lenger Pass conducts through the same range to the western extremity of the lake.

III. Passes from the Alichur Pamir and the Great Pamir.

1. Beginning on the east in the mountain cluster that separates the drainage of the Aksu from that of the Alichur, we find a route that



FORT OF TASHKURGHAN.

leaves the Aksu river at some distance above Murghabi, ascends the Shor-bulak confluent to the pass of that name (14,700 feet), and then, crossing the Sari-tash Pass, comes down upon the valley of the Istik river, which can then be ascended in a south-west direction towards the watershed that divides its headwaters from those of Victoria Lake.

2. At some distance to the west a track leads from Chatir Tash up the Gorumdi confluent of the Alichur river, and crosses the Teter-su or Tetez Pass to the headwaters of the Istik.

3. In the same mountain range separating the Alichur drainage from the Victoria Lake basin on the south-west, and from the Istik or Aksu

drainage on the south-east, there is at no great distance a pass named Kojiguit, which was crossed by Littledale and Dunmore.

4. Continuing westwards, we find a pass named Kara Bilis ("Black Pass"), which was first crossed by Ivanoff in 1883, but which supplies a collateral rather than a direct communication between the Alichur and Great Pamirs.

5. The next pass encountered is the lofty and very difficult one of Bash Gumbaz (16,460 feet), crossing the main range between the Alichur river (which is left at Abdullah Khan below Chatir Tash) and the western end of Victoria Lake. Ivanoff explored it in 1883. Littledale found it blocked by snow in June, 1890.

6. The next route conducts from Sasik Kul southwards over a pass which was named by Dunmore Hauz Dawan, from a small lake on its summit, but which appears on the Russian map as Kumdi (elsewhere Kundey). The route comes out upon the Pamir river a little below Victoria Lake.

7. The easiest of the passes between the small lake-basin above Yeshil Kul and the Great Pamir is, however, the next in order, viz. the Khargosh, or Hare Pass (14,450 feet), which debouches upon the Ab-i-Khargosh confluent of the Pamir river.

8. A little further to the west, a track leads from Bulun Kul, over the Koh-i-Tezek Pass (14,200 feet) and Kok-bai Pass (14,400 feet), on to the Mas confluent of the Pamir river, which it reaches at a point named Jangalik or Yumkhana, below Yol Mazar. These passes were explored by Putiata in 1883.

9. It is by following the same stream, the Mas, that communication is also effected between the valley of the Pamir river and the head-waters of the Shakh-dara river (which flows into the Ghund a little above its junction with the Oxus opposite Kala Bar Panja) over a pass, closed by snow except in summer, which Trotter called the Joshangaz, but which appears on most maps as the Mas Pass (15,120 feet).

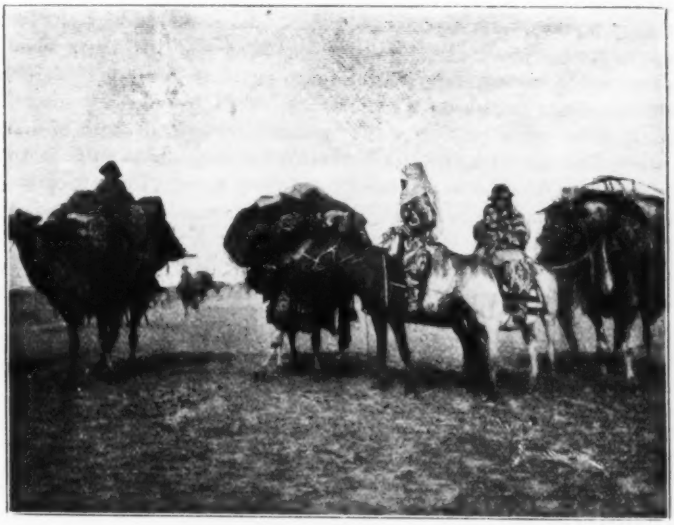
IV. Passes from the Great Pamir to the Little Pamir.

1. Gordon and Trotter, returning in 1874 from the Great Pamir and Victoria Lake to the Aksu valley below Aktash, followed down the Istik river, before mentioned.

2. If, however, access is sought to the same valley above Aktash, *i.e.* to the Little Pamir proper, the upper course of the Istik known as the Chish-tiube can be ascended, and the bordering range of the Little Pamir be crossed by either the Kizil Rabat Pass or the Urta Bel Pass (14,090 feet), which lead down on to the string of lakes below Chakmak Kul. The watershed between the two drainages, in the case of the latter pass, is at a very short distance above the valley and stream of the Aksu.

3. The pass most commonly taken between the two Pamirs is,

however, that which was discovered by the Russian topographer Benderski in 1883, and whose name was changed by the Russians from Andemin to Benderski in his honour. The crest is 15,130 feet. This track mounts the Andemin confluent of the Istik, and then descends upon the Aksu valley some miles beyond the eastern end of Lake Chakmak. At the summit of the pass is a pool or lakelet of water from which—a rare occurrence—a rill flows out at either end, the one to the Great, the other to the Little Pamir. This route was followed by Littledale in 1890, and by Dunmore in 1892; and on their maps the pass is marked as Andemin. The crests of the Benderski and Urta Bel Passes are now the Russian frontier, as fixed by the Commission of 1895.



KIRGHIZ ON THE MARCH IN THE PAMIRS.

4. There remains a pass about which there exists great uncertainty. Gordon wrote in 1874, "A valley at the head of Lake Victoria leads to the Wurm Pass over the southern range, by which the Little Pamir, Langar, and Sarhad are reached in one and two days respectively."* On the other hand, in 1883, Ivanoff and Benderski "endeavoured to find the supposed pass of Varram Kotal leading to the Lake Great Pamir from Wakhan Daria (*i.e.* the Sarhad branch of the upper Oxus), but after several reconnaissances they were obliged to conclude that the mountains separating the Great and Little Pamir were absolutely inaccessible in this direction."† Nevertheless there appears on the

* 'Roof of the World,' p. 157.

† *Proceedings of the R.G.S.*, vol. vi., 1884, p. 139.

Indian Intelligence Map such a pass, named Shor Kara Jilga or Warram, which is made to debouch upon the Sarhad river between Lake Chakmak and Bozai Gumbaz, and which, I suppose, if it exists, comes down one of the many lateral gorges that I passed, and that intersect the range on that side. On the other hand, when I was marching down the right bank of the Oxus from Bozai Gumbaz, and had crossed the Dasht-i-Mirza Murad, I came to a stream which flowed into the Oxus from the north, and which was called Waram. If the maps are (as I suspect) mistaken, this may perhaps be the exit of the pass (if there is one) of the same name. I should add that later on, between 12 and 15 miles below Langar, another stream flows down a very deep *nullah* from the north into the Oxus; and that the Kirghiz in my party reported that by this *nullah* a track ran to Victoria Lake and the Great Pamir. It is possible, therefore, that there may be still unexplored passes in this part of the range. In August, 1895, some members of the British Boundary Commission party essayed to discover this or some other pass over the mountain watershed south of Lake Victoria, but met with no success, finding the range impassable in this direction, and blocked with glaciers and deep snow. In their opinion no such pass exists.

V. Passes from the Pamir-i-Wakhan to the Taghdumbash Pamir.

These I have previously described; viz. the Wakh-jir Pass, which was crossed by Lockhart and Woodthorpe in 1885, Grombchevski in 1888, Dauvergne in 1889, Younghusband in 1891, Dunmore in 1892, and Lennard and myself in 1894, and the elevation of which is 16,100 feet; and the nameless pass in the other and more southerly fork of the Wakh-jir valley, over which Younghusband came on to the sources of the Oxus in 1891.

VI. Passes from the Little Pamir to the Taghdumbash Pamir.

1. The most familiar and easiest of these routes is that which runs from Aktash at the head of the Little Pamir, to Tashkurghan, at the head of the Taghdumbash, across another and better known Neza Tash, known also as the Shindi Pass (14,920 feet). It has been taken by many travellers.

2. A little above Aktash, a confluent on the right bank of the Aksu can be followed up, conducting to the Bayik, Beik, or Paik Pass (called by Capus Bijik-bel). It was crossed by Lord Dunmore in October, 1892, but was blocked with snow when the Frenchmen were at Aktash in April, 1887. It was explored by the members of the Boundary Commission in August, 1895; and falls within the frontier assigned to Russia by their agreement. The crest is 15,470 feet. The track then descends by the Bayik confluent of the Taghdumbash river on to the Pamir of that name.

3. Further to the south access can be gained from one to the other Pamir, with some difficulty and only at certain seasons of the year, by the passes at the heads of less-known nullahs which have hardly as yet been thoroughly explored. They debouch upon the Taghdumbash in the stretch between the Wakh-jir Pass and Kurghan-i-Ujad-bai. There are four of these passes—the Karachukur (taking its name from an alternative title of the Taghdumbash river), the Mukhman or Mihman-guli, the Tagermansu (lying just outside the new frontier assigned to Russia), and the upper fork of the Kukturuk valley. They cannot, however, be considered as regular passes, and are frequently blocked by snow.

Having completed my survey of the Pamir Passes, I now return to my own journey. From Bozai Gumbaz I followed the Oxus valley down to Sarhad, a distance of 42 miles, the present outpost of Wakhan territory and Afghan rule, where the river emerges from the mountain defiles and suns itself luxuriously on the more open plain. The track, however, does not closely pursue the river gorge, whose cliffs are too steep to admit of any passage for a greater part of the way, but at a distance of 7 miles below Bozai Gumbaz bears away from the Oxus, and crosses a wide grassy upland plain known as the Dasht-i-Mirza Murad, which is marked on very early maps, and which leads down to the valley of the Waram stream.* Over a second grassy upland called the

* It is at a point on the left bank of the Oxus, named Baikara, opposite to the Dasht-i-Mirza Murad, that a track runs southwards, conducting (1) to the Irshad and Chilinji Passes into Hunza; and (2) to the Khorabort Pass, leading down the Karumbar or Ishkumman valley to Gakuch, on the Gilgit river. The Irshad route is the most direct between Hunza and Wakhan, and was in frequent use both by men and ponies, until a few years ago it was blocked for animals by a change in the direction of a glacier. The pass called Irshad really consists of two passes across the same watershed, quite close to each other. One is called the Kirghiz-Uwin (16,060 feet), the other the Kik-i-Uwin (16,180 feet). The route from the Irshad comes out in the Guhjal or Upper Hunza valley, at a point between Gircha and Misgar called Khudabad. I believe this to be the pass by which MM. Bonvalot and Capus tried to penetrate into Hunza in 1887, but their descriptions and nomenclature are so confused and inexact as to leave the matter in doubt. Anyhow, they were turned back by the snow ('Le Toit du Monde,' pp. 274, 275). The Chilinji Pass (17,000 feet), or Tash Kuprik (*i.e.* Stone Bridge), lies a little further to the south, and is an exceedingly difficult glacier pass, quite impracticable for animals. From Wakhan it can only be approached after the Khorabort Pass has been crossed, so that two watersheds have to be surmounted before the Upper Hunza valley is reached. After the pass has been crossed, the track joins the Irshad route. The Khorabort or Baikara Pass (15,000 feet) conducts across the main Hindu Kush watershed from Baikara to the headwaters of the Karumbar river, and thence down to Imit at the upper fork of the Karumbar or Ishkumman river. M. Dauvergne, in 1889, after crossing the Baroghil, ascended the Yarkhun river, which had been previously reported, upon native information, as rising in the same lake as the Karumbar river, and found that the Yarkhun did indeed rise in a small lake, one of the numerous Gaz Kuls, but that a low rocky watershed separated this from the larger lake, variously described as Karumbar Sar, Ishki Kul, and Zjoe Sar (?), from which issued the Karumbar stream. About the latter fact there is no doubt, although

Dasht-i-Langar we come back to the main river and to the ruins of the former settlement of Langar, a fort and two stone cairns on a hill, and some deserted dwelling-places and tombs in the valley-bottom. Below Langar the gorge becomes greatly contracted, and the Oxus, gaining volume as it descends, foams noisily along, being here unfordable. Clumps of small timber nestle in the lateral defiles. There is in one place a very bad *pari*, or cliff track, above the river, which Mr. Littledale described in his paper. Our ponies had to be unladen and pushed and hauled up the rocks, and even so constantly slipped and fell. It is a bad place for their loads, and one of my bags was ripped clean open. Further down we again left the main gorge and diverged inland, mounting and descending successive spurs of great steepness and difficulty, down one of which one of our Kirghiz ponies, missing his footing, slipped and fell, and was killed instantly; until at length, mounting to the Daliz Kotal or pass (13,500 feet), we saw outspread below us the splendid vista of the Oxus valley. The river, released from its long mountain imprisonment, spread itself out in countless fibres over a wide watery plain, doubtless an old lake-bed, closed on either hand by magnificent snow-peaks.* Below us lay the terraced fields of Wakhan. Oxen,

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the lake is said not to have a permanent existence, but to consist of an accumulation of snow-water in the spring only. But it is curious that while M. Dauvergne reported the Yarkhun river to Colonel Woodthorpe, as rising in a smaller and independent lake (*Proceedings of the R.G.S.*, vol. xii., 1890, p. 96), in his paper before the Paris Geographical Society he described it as rising in a great glacier, which coincides with the information that I received from Lieutenant Cockerill, who had visited the spot (*Scottish Geographical Magazine*, 1892, p. 365). This glacier, in common with another that descends upon the Yarkhun river immediately south of the Baroghil Pass, bears the name of Chatiboi, or Chittibui, which Major Raverty ('Notes on Afghanistan,' p. 155) explains as Chitti (Hindi for "white") Bhuin (Sanskrit for "earth"), a very appropriate designation for a glacier. The rise of the Yarkhun river in this glacier is reported by some of the native travellers, whose itineraries are published by Raverty (pp. 155, 188), and is corroborated by the "Mulla," a map of whose explorations (in 1876) appeared in the *Journal of the Asiatic Society of Bengal*, 1878, part i. He depicted one branch of the river as rising in a glacier named Chatiboi, but this was the Chatiboi opposite the Baroghil. Of its more distant namesake he was not aware. Major Raverty is consequently quite mistaken, if for no other reason, in saying (p. 181) that "the Dragon lake of the Chinese pilgrims Hwui Seng and Sung Yun in the Puh-hoi mountains is the *lake* of Chitti-Bui." I suspect that the Kotal or Pass of Palpi Sang, mentioned in one of Raverty's itineraries (p. 188) as "a long and narrow *darah* extending upwards for a distance of nearly ten *kuroh*, northwards from Chitti-Bui," is the Khorabort Pass, unless a confusion has arisen with the lower Chatiboi glacier, in which case it would be the Baroghil. In 1891 Colonel Yonoff, after arresting Captain Younghusband at Bozai Gumbaz, crossed the Oxus and the Khorabort Pass, which he somewhat rashly rechristened Yonoff Pass, and then, turning westwards, in the inverse direction to M. Dauvergne, descended the Yarkhun river, mounted to the crest of the Darkot Pass, and finally returned to the Pamirs by the Baroghil and Sarhad.

* This plain or valley was called Sarigh Chopan or Chaupan as early as the time of Baber (*vide* 'Erskine's Life,' i. 339, 340, 510), and in the chronicle of Mirza Mohammed Haidar (1543), and again by Munshi Faiz Bakhsh in 1870. The name seems now to have fallen into disuse.

goats, and sheep were being driven in at the sunset hour, and thin curls of smoke arose from the settled habitations of men. Descending to the valley, we camped near one of the Wakhi villages in its bottom, to all of which the Afghans apply the collective title of Sarhad (10,400 feet). Their frontier post is at Chehilkund, on the right bank about 3 miles lower down, where, in a dilapidated fort on a rock, were stationed a *havildar* and a few seedy sepoys.

Sarhad was the place where, in 1890, Mr. and Mrs. Littledale, coming from the same direction as ourselves, were stopped for twelve days by the officiousness or discourtesy of the Afghan captain from

CAMP SCENE, PAMIRS.

Kala Panja, 50 miles further down the river. I had thought to have sufficiently guarded against the repetition of any such *contretemps* by having requested the Amir of Afghanistan, whose guest I was going later to be at Kabul, to send word to his officials in Wakhan of my proposed arrival. This he had done, and the petty *havildar* at Sarhad was well aware of my identity. Nevertheless, the opportunity of swaggering a little before the inhabitants of this remote dependency, and of humiliating the representative of a foreign nation, was too good to be lost; and the *havildar* of Chehilkund, having turned up at his leisure and offered halting apologies for a rudeness which was manifestly designed, presently informed Lennard and myself that we were Russian spies, and that he must accordingly detain us until his commanding officer arrived from Kala Panja. How a Russian spy

could have come by our route from Hunza, could be proposing to re-enter British India by the Baroghil Pass, and could have been described in a letter from his own sovereign as an English traveller and a friend of his own, the *havildar* did not attempt to explain. Leaving him to reconcile these contradictions, and informing him of my sincere intention to mention the matter at Kabul later on, we packed our loads, and, having the superiority of numbers, marched off undisturbed.

I may here perhaps mention the sequel. At my first audience with the Amir at Kabul, he raised the matter, having received my letter of complaint, and having instituted inquiries. The reply of the now frightened *havildar* was really so ingenious as to extort my reluctant admiration. "He was still awaiting," he said, "the arrival of the great English lord *sahib*, whose coming had been announced by His Majesty the Amir, and who would no doubt appear in uniform with an escort of 1000 men. In the mean time two of the lord *sahib's* servants (*i.e.* Lennard and myself) had already passed through with an insignificant following. He himself would continue diligently to await the great lord." I heard afterwards that this polite intention on the part of the *havildar* had been frustrated by an imperative summons to Kabul; but what may have since transpired I do not know.

Crossing the bed of the Oxus, which is here about three-quarters of a mile in width, and fording the river, which was divided into three main channels with from 3 to 4 feet of water, we then struck due south into a gap in the hills, nearly half a mile wide, up which lies the ascent to the Baroghil Pass. For nearly 3 miles the track runs through a flat and swampy valley with abundance of grass, called Pirkhar. It then bears a little to the west, and, gently rising, follows for 5 miles a long and stony bay completely filled with the bed of the Pirkhar stream. At the head of this valley two tracks bifurcate. That to the south-east ascends to the Shawitakht Pass (12,560 feet), which is an alternative to the Baroghil for travellers proceeding directly to Darkot and Yasin, and from there descends on to the Yarkhun river, from whence a gentle ascent of 8 miles leads to the *ailak* or summer pastures of Showar Shur, and from thence over a glacier to the Darkot Pass (Pamir Commission, 1895, 15,200 feet; Littledale, 15,950 feet) and the route to Yasin. The second track, which I followed, led more to the south-west, and, after a climb of three-quarters of an hour, brought me to the rolling saddle or dip in the main range of the Hindu Kush which is known as the Baroghil Pass (12,460 feet). This remarkable depression is from 400 to 600 yards in width, and its crest is about 12 miles from Sarhad. On the southern side the track descends over a gentle grassy slope, that would provide the most admirable golf-links, to the valley of the Yarkhun river, which it strikes some miles below the Shawitakht route. The grassy slopes on both banks of the river are known as Dasht-i-Baroghil. In front of one, along the entire descent, the foreground is

filled by the magnificent Chatiboi glacier, which plunges down like a prodigious frozen Niagara between two snowy peaks of the confronting range. From here, also, after fording the Yarkhun river, an ascent can be made along the edge of a great glacier to the summit of the Darkot Pass. The latter, of course, and neither the Baroghil nor the Shawitakht, is the real defence of India on this side, since it would be almost impassable by armed men.*

From our camp on the Yarkhun river,† where Lennard and I separated, he to return to Gilgit, I to proceed to Chitral, I followed down the gorge of the Yarkhun (also called Mastuj, Chitral, Kashkar, and Kunar river) for three days, a distance of 72 miles, to Mastuj. On the first day I had to ford the river from bank to bank twelve times, and so to circumvent (I might otherwise have had to cross) six glaciers. Of these the great Chatiboi, 600 yards wide, comes right down to the edge of the river, and there towers, a precipitous wall of ice, above the foaming water.‡ Woodthorpe and Barrow, Younghusband and Cockerill were the only Englishmen who had previously descended by this route; but my journey, made at the beginning of October, proved, as the Mehtar of Chitral afterwards told me, that, though very difficult in summer, when the river is in flood and the glaciers require to be crossed, it is available from the early autumn till the late spring, and must consequently be regarded as one of the main possible routes into India. Fortunately, there is at least one place in the valley where a small body of men, taking advantage of the natural conditions, could resist a force ten times their superior in numbers. Nor is it very likely that an invading army from the north, whose objective was Chitral, would trust itself to a route that is practically confined to a single gorge for 140 miles, when the much easier and shorter route by the Dorah Pass is available. At Mastuj I joined Younghusband; and here ends that portion of my journey which I undertook in this paper to describe.

(To be continued.)

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* *Vide* the account of Littledale's difficult crossing of the Darkot in July, 1890, *Journal of the R.G.S.*, vol. xiv., 1892, pp. 24, 25. Lennard, after leaving me (in October, 1894), experienced almost equal trouble.

† At this point there was formerly a bridge across the river, but it was destroyed by Ali Mardan Shah, the former ruler of Wakhan, on his flight from the Afghans in 1883.

‡ This is the lower Chatiboi, the name—a familiar one for glaciers in these parts—being also sometimes applied to the neighbouring Darkot glacier. I have previously shown that it is again attached to the glacier-source of the Yarkhun river.

EXPEDITION THROUGH SOMALILAND TO LAKE RUDOLF.*

By Dr. A. DONALDSON SMITH.

During a sporting trip in Somaliland over two years ago, I conceived the idea that I could carry an expedition across that large extent of unexplored country lying between the Shebeli river and Lake Rudolf, with Somalis as a guard, and camels as pack-animals. Accordingly I came back to England, and set to work to fit out an expedition, engaging the services of Mr. Edward Dodson, a young taxidermist at the British Museum, and preparing to do as much useful work as possible. The Society gave me the only material assistance I received, in the shape of a loan of valuable instruments, so that, with these and the excellent instruction I received from Mr. John Coles, I was able to make an accurate map of the country traversed.

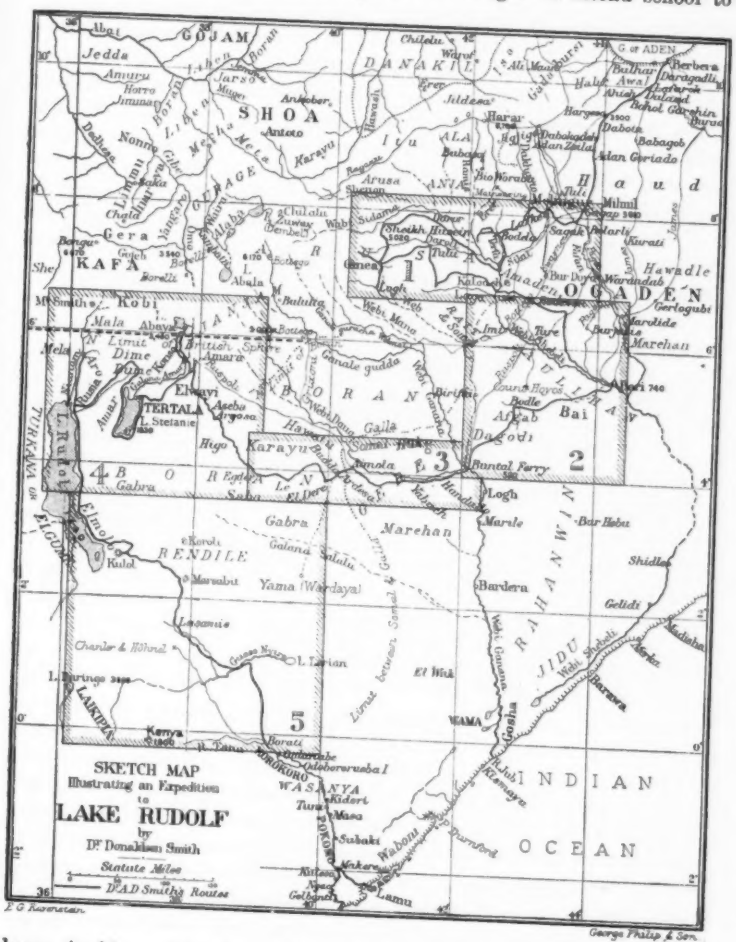
My friend, Mr. Fred Gillett, asked me to permit him to accompany me, with twelve men and twenty camels, in order to get some big game shooting. To this I willingly agreed, as I was desirous of his companionship. Grave doubts were expressed, both here and at Aden, of our ever being able to enter the Galla country, let alone our reaching Lake Rudolf. Ever since the days of Sir Richard Burton, who first endeavoured to make the journey, many attempts have been made to reach Lake Rudolf without success. Captain Bottego and Prince Ruspoli had gone far up the river Jub, or Sonana, and it was reported that the Gallas had resolved to unite in preventing any other white men from entering their country, on account of the manner in which these two Italians had acted, and that it would be impossible to cross the Galla countries without a very large army. However, with light hearts, and fully confident that we should be successful, we set sail from London on June 1, 1894.

We were soon in Berbera, with eighty Somalis and two good headmen. The thousand preliminary details need not be dwelt upon; it is sufficient to say we were heartily glad when July 10 came, and we were able to give the order to march. But I wish to thank Mr. Charles MacConkey, of Aden, and Mr. Malcolm Jones, resident at Bulhar, for their kind assistance in enabling us to get off so early.

When we started from Berbera, we had only 75 camels, instead of the 110 we needed to carry our stores. This was owing to the fact that there was such a drought that camels could get nothing to eat near the coast. The 75 camels we gradually increased to the required number as we went inland, but I was obliged to move slowly at first. I will not detain you long with an account of our journey through Somaliland, as the lions have long ago offered sufficient inducements to explorations in that country. Hiring extra camels to carry water

* Paper read at the Royal Geographical Society, January 6, 1896. Maps, p. 200.

at Hargesa, we were soon across that 100 miles of bushy, waterless plateau-land called the Haud, and found ourselves at Milmil, in the Ogaden country. This is the land of fat camels and fine-looking men and women. The people have lighter complexions and finer features than any other Somalis. The boys are all obliged to attend school to



learn Arabic, a bit of training that improves them in every way. The country is mostly flat, but the Abyssinian highlands are continued down in Western Ogaden in the shape of low mountain ranges and hills till they lose themselves above Ime; and another mountain range runs from Milmil south to Bari, on the Shebeli river.

As our route lay directly west, it was principally through a rough country. The Ogaden is dry like the rest of Somaliland; the wells and pools of water in the river-beds are far apart, and to the south-west the water is brackish. This is not the case, of course, during the spring and autumn rains; but it is astonishing how quickly the country assumes its half-parched appearance after the rains have ceased.

From Milmil we marched a little south to Sesabene, a settlement that was of much importance. It was situated in a little valley, where there were many wells and a good deal of green grass. I saw more cattle and donkeys here than in any other place in Somaliland. The people were very civil, and glad to trade with us. You may imagine my chagrin when I heard, a few days afterwards, that they had just been raided by the Abyssinians under Ras Makunnen. Their animals had all been driven off, the boys and girls taken as slaves, and the older people killed or mutilated. This same Ras Makunnen has been a great leader in the war with the Italians.

The country now became gradually more interesting to us, as it was more unknown. We had one march of three days through a waterless hilly country called Sibi. The Somalis also call this Habr-a-erde, which means "bad for old women." This name impressed us very much, as we had seen the sad state in which old women roam about Somaliland 'oo often. The Somalis are the best savages in Africa, but they have their little ways, and one is not to trouble about a woman after she gets old, whether she be sister or cousin or aunt. So many of the poor old wretches are doomed to wander about, eating berries or begging, till they die of gradual starvation, or are caught by lions or hyenas.

The middle of August found us at Bodele, on the Terfa tug (*tug* is the Somali for *wadi*, a dry river-bed); but before reaching here we had the pleasure of meeting Captain C. J. Perceval, who had penetrated farther than any other white man, except ourselves. At Bodele we found a few Somalis, the last we were to see for many months. My desire was to keep on as nearly west as I could, but the Somalis told me that was impossible—that even a man empty-handed could not reach the water of the Erer, owing to the great rocky walls that surrounded it. The only thing to do was to go and see for myself. Leaving Mr. Gillett with the caravan at Bodele, as he wished to do some lion-shooting, I started off with Dodson and a few boys. We had many difficulties, having to lift five camels bodily over rocks several times. Finally we had to abandon the camels, but not until we had got within a mile of the river. It took some climbing to reach the water, but we were rewarded for the trouble, as a more lovely valley is not often seen. Narrow, and with high mountains rising on either side, it is nothing but a mass of colour, from the yellow reeds along the edge of the stream to the flowering vines covering the rocks. There were many birds, the most striking being a crested starling, of which only a single specimen

had been seen before. There were deserted Galla villages along the edge, and I saw fresh footprints, but I did not succeed in getting any native to approach. For three days on this trip Dodson and I lived on the flesh of a rhino, that had managed to get within a yard of me before I could stop him. On reaching my caravan, I found Mr. Gillett had killed a fine lion. Of course there was no crossing the Erer, so we had to march down Terfa tug to its junction with the Shebeli river. The Shebeli was flooded, and it was all we could do to cross it. We succeeded, but not without the loss of a camel-man, who was washed away and drowned, and two ponies. Mr. Gillett's mule fared badly also, through the greediness of a crocodile. Now was the time for the terrible

LAFERUK, TWO MARCHES FROM BERBERA.
(*From photograph by Mr. P. Gillett.*)

Gallas to appear. Where was the country teeming with lusty warlike people? Certainly not here! What we found as we progressed was only a few poor villages of a hundred huts each, and the natives presenting the most abject appearance imaginable. Only four years ago they must have been a fine race of men; they loved to tell us of their former glory; their eyes would light up, and they would forget for the instant their present condition. Now the Abyssinians are the masters, and these poor people are only the remnant of a great tribe. They are the Arusa Gallas, and their native land extends 150 miles west of the Shebeli river. You could not find over five thousand souls among them now.

They resemble the Somalis very much in having slender figures and curly hair, but their skins are much darker, and their features more irregular. The Arusa Gallas are blacker than any of the other Gallas I visited. They are very free from immorality, marriage rites being strictly observed. The boys marry usually at the age of fourteen, and the girls at twelve. Later on they may take another wife, or even a third, but I did not hear of any man having more than three wives. Their religious beliefs are very simple. Wak, as they call their god, is merely a power capable of working for their good or evil. They do not associate their idea of Wak with that of a moral being. All the phenomena of nature are embodied in the term Wak. When they sacrifice their animals under a tree and pray for rain, they pray to the rain itself and call it Wak. They differ from the Borans and the Gallas living far to the south, as these people look upon Wak more as an all-powerful man living up in the heavens ready to avenge misdeeds or help in a just cause, according to the very questionable native ideas of right and wrong.

For several marches the country was dry and barren like Somaliland, except along a small river called the Darde, or Daroli, that I discovered emptying into the Shebeli; but we soon began to feel a few raindrops, and then more and more. We were getting up into a high, well-watered mountain region. Nature assumed a different dress. There were the thickest sort of thorny acacias and mimosa trees and bushes, with here and there open grassy plains covered with fine green grass up to one's knees. Giant sycamores, pine and cedar trees, and euphorbias spread out their limbs over veritable flower-beds. Geraniums, fuchsias, sweet-peas, and countless other plants, seemed to be trying to crush each other out.

On September 17 we arrived at Luku, a place of some importance as an agricultural centre, and we were astonished to find there a stone tomb erected to a Mohammedan Sheikh, Abai Azid. It was a rectangular building, with a dome in the centre, and covered with white plaster. "Wait till you see Sheikh Husein," was the cry of the natives when I admired their tomb. They indicated a hill 30 miles off to the south as being the location of Sheikh Husein. The view was extensive. Beyond the hill we saw, rising up to the height of 9000 feet, a noble group of mountains, the two highest peaks of which are called Walenzo and Gubayu. I have named this group the "Gillett mountains," in honour of my friend. It is Mr. Gillett's desire, as well as my own, that the native names of Web and Wabi should be retained for the river passing south into the Jub and the upper Shebeli respectively. Further to the west, and quite distant from any other mountain, a bare rocky mass towered high into the air, called Mount Abugasin. Little did we dream that we should not get out of sight of these mountains for two months.

We were glad to reach Sheikh Husein a few days after, as we were all fatigued with the hard work we had had to do in the various marches. Many a rock had to be rolled aside, and miles of road cut through dense bush. We were given the name of road-cutters by both Abyssinians and natives. The best paths in the country are scarcely fit for donkeys. Strange it seemed to be in a town, after all this, where there were stone buildings. On one side was an acre of ground enclosed by a high stone wall with a curious gateway. Inside was the imposing tomb of Sheikh Husein, and several mosques. There was also a well in the enclosure, where the women drew their water. The tomb was enclosed by a second wall, and was a very imposing structure 30 feet high.

WELLS OF GURATI, SOMALILAND.
(*From photograph by Mr. F. Gillett.*)

Sheikh Husein was a Mohammedan saint, who came to this country from Bagdad two hundred years ago with his lieutenant, Sheikh Mahomed, in order to convert the Gallas. He had many children by Galla wives, and their descendants form the greater part of the population of the town at the present day. Many are the tales of magic that Sheikh Husein wrought. He was supposed to have come from Harer on a wishing-cloth, and to have built mosques in one night. There were five other white tombs of sheikhs scattered about the hilltop on which the town is situated, making quite a gay appearance.

The natives of Sheikh Husein are much superior to the Arusa Gallas of pure blood. They are very light-coloured, and have much more

regular and refined features. Their town has been held in reverence by all the Arusa Gallas as a holy city, and also as a great centre for trade, ever since its foundation. Strange it is, however, that although they have kept up their observances of Mohammedan law, the teachings of Islam have not extended far beyond their immediate neighbourhood. They are quite apart from any other people I met in Africa in their high standard of morality. Not only do they have a personal sense of honour, but they are able to do little acts of kindness from purely unselfish motives, and even feel a sense of gratitude when they are the recipients of favours. They are well clothed in garments of their own manufacture, make excellent pottery, and are most skilled as smiths.

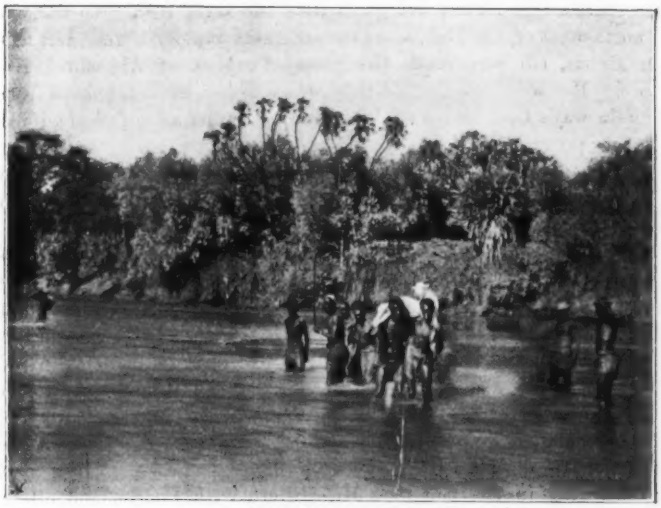
We could not rest here in peace, however, for it was not long before the masters of this country made their presence felt. We had seen several Abyssinians before reaching Sheikh Husein, but now they commenced to come to the camp in large numbers. It was very cold, and torrents of rain fell every day. The Somali boys were suffering a good deal, and finally broke out in open rebellion. Only a dozen stuck by the expedition. After a good deal of trouble, the camp was restored to order; but there was still much discontent shown.

A message came from the Abyssinian general in command of this country, Walde Gubbra, requesting us to visit him. It would have been impossible to move the whole caravan across the Gillett range, and I could not leave the caravan for fear of the boys deserting. Mr. Gillett came to my rescue, and very kindly undertook to make the arduous and dangerous trip to the Abyssinian town Ginea by himself, accompanied only by eight boys. After Mr. Gillett had gone, I spent an anxious week drilling my boys, and getting them accustomed to shooting straight, when a letter arrived from my friend, saying that Walde Gubbra was a good old man, but wished to see me personally, and that the Abyssinians had promised us every assistance. I had to move the caravan a long distance round the Gillett range to the south-west, and then march it up to a high plateau, so I could have it near while I visited the Abyssinians.

Much time was spent by Mr. Fred Gillett and myself in the Abyssinian camp, while Dodson remained with the caravan, ready to give instant notice if anything went wrong. Every honour was shown us as guests of Emperor Menelek and of his regent Walde Gubbra, and all the luxuries the town of Ginea could afford were showered upon us. Slaves were appointed to do our bidding; enough Darde or Abyssinian wine sent us to half fill the tun at Heidelberg; honey, spiced meal, cakes, and, best of all, abundance of cows' milk. There were some 4000 souls living in Ginea, all Gallas, except the garrison of 450 riflemen. The Arusa Gallas here, as elsewhere, were regarded as slaves, and were even sold in the market as such. The troops were thoroughly drilled, and armed with Remington and French rifles. A braver,

hardier, more energetic, though savage, lot of men could not be found. We made up our minds then and there that any nation interfering with them would have her hands full. But we earnestly wished that they, as savages bearing arms against other poor defenceless Africans, should have such a drubbing that they would not forget it and try to extend their sway further. Let those good people who take an interest in uncivilized nations cast a thought on the black neighbours of the Abyssinians, who are in the worst plight; and let them offer their support to the Italians in their present struggle.

Walde Gubbra received us in great state at first, in an enormous



THE WEBI SHEBELI.
(*From photograph by Mr. F. Gillett.*)

tent made of black cloth. Turkish rugs were spread about for the officers and guests, while he reclined on a sofa dressed in long silk robes. The officers made a fine display with their beautiful white and red cloaks of the softest material. We were soon asked informally to the old general's house, where we met his wife and ladies of his household. The large circular wooden building was not a handsome structure. It was always full of slaves, monkeys, and fleas; and eating honey with one's fingers and carrying on a conversation in two languages were not amusing, so we would make our visits as short as possible.

We were delayed a month about Ginea, waiting for a reply to a letter I sent to Emperor Menelek, asking him to allow us to proceed. We could wait no longer, although Walde Gubbra kept urging us to do

so. Without letting him know, we started west, and reached on November 10 a great grassy plain nearly 8000 feet above the sea, called the Budda.* This plain extends west some 50 miles according to native report, and is then broken by the valley of the Shebeli river or Wabi, as it is called by the Gallas. The Wabi rises near the chain of lakes extending to the south from Dembel or Zuwai, flows about the southern base of Mount Abugasin, where we investigated it ourselves, curves north as it passes Sheikh Husein, and then south again near its junction with the Erer river. Report went on to state that to the south-west a great mountain group called Worgoma towers high into the air, some natives even telling us it was often covered with snow. From this Mount Worgoma rises the river Web. To the west and north-west of the Budda the country gets rapidly higher and more mountainous, till you reach the present capital of Abyssinia, New Antoto. But now the expedition was confronted by one of those mountain walls that leaves no doubt in one's mind as to the possibility of further progress.

Down came the old Abyssinian general, with his army mounted on mules and riding at a quick pace. As we afterwards learned, the Abyssinians expected to ride in among us and drive us about like a flock of sheep, after robbing us of our stores, and sending the three Europeans to Antoto. Now came the time for our Somali boys to show that one great quality they possess—steady nerves in times of immediate danger. They had not forgotten the drilling they had received, but, on the alarm being sounded, were in their places in an instant. Walde Gubbra was taken aback on seeing a determination on our part to protect our own. He came to an abrupt halt when 80 yards away. I walked over with my interpreter to where Walde Gubbra had seated himself, unarmed save a little revolver I held concealed in my pocket. My safety lay in the fact that Mr. Gillett, with Dodson and all the boys at his back, stood ready to avenge any act of violence the Abyssinians might attempt. The old general rose and read a letter from Emperor Menelek, ordering us to return the way we had come, while rifles were being pointed at me from all sides. If, by accident or otherwise, one of the Somalis or Abyssinians had fired his rifle, there would not have been a man among us left to tell the tale. There was nothing to do but accept the situation, bad as it was. I do not think the prospects of ultimate success of any expedition ever seemed worse than they did for mine for the next three months. It was nothing but one continual wrestle with the desire of all my Somalis to return home. Even my head-man, Haji Idris, did everything he could to make me give up the idea of carrying out my original plan. I hope I shall never be obliged to undergo such a three months of trouble again.

* "Budda," or rather "Badda," is the synonym of the Abyssinia "Dega."

I shall not tire you with details, but before we get back to Somaliland I must mention some wonderful caves we discovered. Hearing that they were some 30 miles to the south of Ginea, Mr. Gillett and I avoided the Abyssinians for a few days on the excuse of elephant-hunting, and visited them. We were thunderstruck when we discovered what a superb underground palace the river Web had carved for itself as it dashed through a mountain of quartz. It seemed as if Nature had confined herself to human ideas of the grand and the beautiful in this work, so regular and ornate were her designs. Passing columns and arches and altars of apparently the whitest marble, the clear water disappeared into the dark recesses of a pillared temple. I can give you no idea of how ornate the columns were, with their beautiful capitals and splendid bases, or of the magnitude of the subterranean

CAVES OF WYNDLAWN, AT NORTHERN ENTRANCE.

chambers. I shall consider myself successful if I can only leave you with an impression of something vast and beautiful.

Leaving the caves of Wyndlawn, as I have named them, we were not long in reaching a place called Tulu, halfway between Ginea and the Shebeli river. This is situated on the river Darde, the perennial river I found flowing into the Shebeli, and which rises from the Gillett mountains. Here I received a letter from Emperor Menelek, enclosed in an envelope bearing a gilt crown. The letter was in Abyssinian, but translated by a Frenchman into French and English. Menelek, styling himself the Conquering Lion of the Tribe of Judah, Emperor of Ethiopia, King of Abyssinia, etc., was profuse in his polite speeches. He did not "forbid my going where I wished, but only advised" me not to do so. Thanking him in a hasty letter for his advice, I took his words too

literally, and made another attempt to strike for the south-west. But giving friendly advice is Emperor Menelek's diplomatic method of giving commands, to be backed by Remingtons. Down came Walde Gubbra and his army, and back went our little caravan all the way to the Shebeli river.

The country we passed through to the east of the caves of Wyndlawn was very rough and hilly—bushy in places, but becoming more stony and barren and cut by deep waterways as you near the Shebeli river. There are no inhabitants within 25 miles of the Shebeli until near Imi, 30 miles south of our crossing-place. I sent some of my boys ahead with instructions to rush on to Berbera, buy cloth and camels, and bring our letters, telling them at the same time that the quicker they got back to the caravan, which they were to meet at Bari lower down the river, the more pay I would give them. We found so little water in the Shebeli river that we could walk our camels across loaded, only a little south of the point our poor camel-boy had been swept away by the raging torrent four months previously.

To make the Abyssinians think we were going straight home, we marched some distance into Somaliland before going to Bari, 150 miles south. Being Christmas-time, it seemed as if something enlivening would happen, and we were not disappointed.

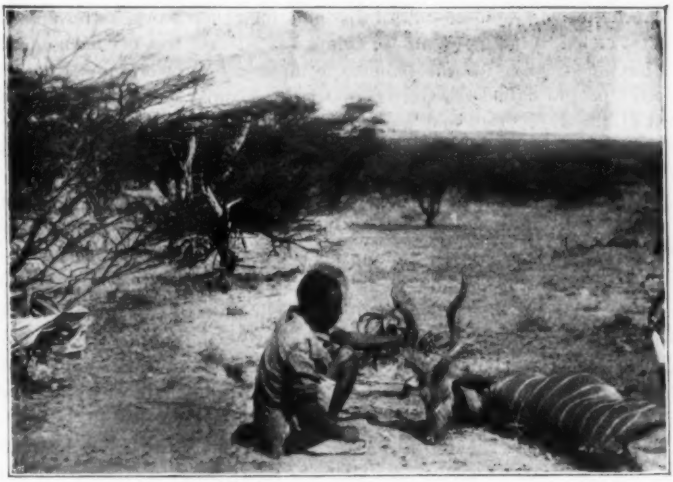
We were to have the pleasure of seeing a white man once more. Prince Boris, a Russian sportsman, happened to be in the neighbourhood; so we quickly arranged to spend the festive season together, and a jolly time it was, as you may imagine. After seventeen long marches we were at Bari. I should like to tell of the interesting people we met along the Shebeli river, who were going to war with one another, but time will not permit. On January 27 the sad news came of the death of Mr. Gillett's father; the boys had arrived from Berbera with cloth and letters. Coupled with the sad news were announcements that made it imperative that the friend who had done so much to help me and make the journey pleasant should return home at once. In a short time Mr. Fred Gillett was on his way to the coast. I sent out a collection of natural history specimens, with a small escort, at the same time.

I was left with Dodson as my only European companion; but, fortunately for me, in securing an excellent taxidermist and assistant I had also found a man full of pluck and patience. No sooner had Mr. Gillett left than the whole camp was down with fever, including Dodson and myself. There were scarcely enough boys to mind the camels. The majority of the boys wanted to go home, of course. I will cut the story short till we reached the Jub, as it is altogether too depressing.

On February 1 we were across the Shebeli, and on the way once more to Lake Rudolf. We were obliged to get across quickly to the Jub, as the Abyssinians might be down upon us at any moment. So all

hands that were well worked to help the sick and get the caravan ahead.

The country between Bari and the Jub river is extremely monotonous. It is a sandy plain, rising gradually to 2000 feet midway between the two rivers. The elevation of the Shebeli river is 740 feet, and the Jub 590. It is a very open country, with only three or four ranges of hills running north. The wells are far apart, and all the water is brackish. This fact, I may add, did not enable us to bear fever any better. The inhabitants for 80 miles west of Bari are Ogaden Somalis, who call themselves Aulihan, Rer Ali, and Afgab. After them



LESSER KUDU. SHOT BY DR. DONALDSON SMITH.

come the Dagodi, who are Mohammedans, but have a great preponderance of Galla blood. These tribes are nomads raising camels and sheep except along the Jub, where the Dagodi grow large crops of maize and millet.

The first river we came to was the Web, which we had first seen running through the caves of Wyndlawn. We got there in fifteen long marches. The natives had all been friendly so far, but they would not trade, although I offered much cloth for their animals — a bit of eccentricity on their part that necessitated our eating several sick camels. But along the river they all fled from us, as they had heard bad news about the white man. They were going to collect to fight us along the Jub. We managed, however, after much trouble, to gain their confidence so far that, instead of fighting, they set to work and helped us across the great river lower down. We did not cross the Web, but

followed it down to its junction with the Jub. The only way to cross this latter stream, which was 85 yards wide in most places, and very swift, was to go another march south to Buntal, where the river widens out over 200 yards. This is just below the point where the river Daua empties into the Jub from the west.

Once across the Jub, I seemed to enjoy a new existence. The strain I had been under for three months to keep the caravan together after having been turned back by the Abyssinians was removed; no more fear of that African cossack and no more need to fear any desertion on the part of my boys. My good followers were far enough away from home now to think no more about it, and had begun once more to settle down to camp life. Large doses of quinine had done their work, and a present of a fat camel, brought by an old chief, was all that was needed to make our happiness seem for the moment complete. We were now among a tribe of people called the Gere Gallas, whose country extends 100 miles west of the Jub. But just along the banks of the Jub and Daua are a lot of pure-blooded negroes of quite a distinct type from the Gallas. These Seedy Boys, as they are popularly called, make up half the population of Bari, on the Shebeli river. They raise maize and millet, and usually go about naked.

On the Jub we crossed the lines of march of the two Italian explorers, Prince Ruspoli and Captain Bottego, who had followed the course of the river some distance to the north-west. Their ambition also had been to reach Lake Rudolf, and come out at the south by Mombasa. Prince Ruspoli got much farther inland than any other white man except ourselves, having come from the Jub to the Amara mountains, as I shall point out.

Although we were all feeling in a better mood when we left the Jub, the real state of affairs was far from being what we desired. The large amount of extra cloth that I had ordered from Berbera seemed to have no prospect of being touched. The natives did not wish to sell anything, or else offered their animals at something like six times their value. My loading camels were giving out and I was in the greatest need of fresh ones. We managed to buy an animal from day to day from the Gere Gallas, but we could by no means keep pace with the waste that went on. We found the Gere Gallas very peaceful and friendly for the most part. They raise crops about the rivers, but their main occupation is breeding animals for food. There are three divisions of the Gere Gallas—the Gere Moro nearest the river, then the Gere Badi, and to the west the Gere Libin.

The Gere Gallas are an intelligent lot of people; very light-coloured, and of powerful, slender figures. Though many of them have no religion at all, Mohammedanism is fast taking hold among them. They are very rich in camels and other animals, and can afford to buy plenty of cloth from Somali traders. They appear very respectable in their long

flowing white garments. What is most remarkable, they are at peace with their neighbours the Dagodi and the Borans.

Our route lay for a short distance along the Daua, and then, as that river veered off towards the north, we left it and kept as nearly west as possible. There was plenty of game about, and I had good sport; but the one animal that above all else succeeds in breaking up the monotony of a day's march, whether you wish it or not—the rhinoceros—was not about.

The Daua is fringed with palm trees, from the juice of which the natives make an intoxicating drink. I crossed one day, and went at right angles to the stream for some distance with two of my boys. To my annoyance, I came upon the Daua again, flowing in an opposite direction; but I was surprised to find, at the bend of the river, a band of about a dozen wild-looking men and women, thoroughly intoxicated, and having a fiendish sort of time together, dancing and tumbling about. I tried to approach them as gently as possible, but it was of no use; the instant they caught sight of me they screamed and bolted. Hundreds of monkeys overhead caught the idea there was something wrong about my white face, for, setting up a deafening screaming, they pelted us with the fruit of the dum palm until we were glad to retreat. Except very near the river, the country was barren, and great wind-storms were raging when we were there. It was not an uncommon occurrence to wake up at night and find our tent-ropes dragging about over our bodies, and clouds of dust thrown in our faces. The Daua is 40 yards wide, but only 2 to 3 feet deep, with a current of 4 miles an hour.

Bidding farewell to rivers for a long time, we continued west, and arrived at the wells of El Modo on March 3. This was an important place, as beyond there is a mountainous tract of country in which there is no water for three days (45 geographical miles). A rest of a few days was not enough for my tired camels. It was all we could do to get across the desert. I had to throw away many boxes, including such luxuries as wine and tinned fruit; and we could carry so little drinking-water that we suffered greatly the last day. We had to undergo all this in spite of the fact that we had seven camels carrying cloth for trading, besides many others carrying beads and brass wire. Twelve camels died on the way, and when we reached Aimola, where there was water, there were only 60 camels left, and most of these were completely tired out. The natives had all fled; there was but one thing to be done, and that was to run after them and force them to come to camp and have a shauri with us. We could catch no natives, but succeeded in finding great droves of fine camels. This is what we wished, as the owners must surely come to us when the camels were in our hands. We had not long to wait; soon the camp was full of natives, to whom I returned every animal I had taken from them. The effect

was instantaneous—the whole country came to trade, and, to show their confidence, most of the men brought their wives and children along.

In the ten days we spent there we bought about forty camels and many good cattle and sheep, the natives forcing us to give, however, a high price for everything. I had some good sport here with elephants, rhino, and giraffe very near our camp. Aimola is situated on a fertile plateau, and is just on the border of the Boran country. The Gallas living here belong to the Gere Libin tribe, and are not Mohammedans. The plateau itself, called the Budda Ardesa, is not inhabited. The district inhabited by the Gere Libin begins one march to the north of the Budda, and extends north about 60 miles, the banks of the Daua river being the most thickly settled part.

The spring rains had now begun, and were to continue almost incessantly for two months. It was very cool, and so it was with the best spirits that the two Europeans of the party, at any rate, tramped down the edge of the plateau and found themselves in the lovely valley of San Kural, in the country of the Borans, of whom native traders had brought out such glowing reports.

We were astonished to find that, instead of being divided up into innumerable tribes, these Borans were one great united people. Their history resembles many a European one. The Karayu Borans, who were the strongest, subdued their neighbouring kinsfolk, and by excellent management formed a strong central government, in which at present nothing but harmony prevails. The hereditary king of the Karayu Borans is therefore ruler of all the Borans, and the present owner of that title is named Abofolato, a fat, clever old man living far to the north-west. The Borans I found about San Kural were the Sakuyu, and there were with them some of the Gabra or low caste Borans, who use bows and arrows. The chief difference I noticed between the Sakuyu and the other Borans was that the former have their heads shaved, and a tiny little pigtail sticking straight up from the middle.

The Borans received us with every show of friendship, as they said they had heard we wished to travel peacefully. As we gradually proceeded through their country they brought animals to trade, and provided guides. It was a lovely fertile country from beginning to end—a series of well-watered valleys, lofty mountain ranges, and cool, delightful plateaux. The roads were often difficult for the camels, and we should have to spend a whole day hard at work to do a distance of 5 or 6 miles. Seventy miles past San Kural are several most extraordinary wells—great round pits dug in the solid rock 80 feet deep and 50 feet wide, with long entrances cut gradually down to the bottom. The beginning of these passages would be 60 yards from the well itself in some cases, and would have rough steps cut in them, reminding one of the steps of Clovelly. The wells were cut by people that were much more civilized than the Borans.

After going a long way west through the Boran country, we started up towards the north, as I wished to visit the king Abofolato, and then try to settle the position of Lake Abaya, as this lake, marked in all sorts of places on the maps of North-East Africa as Lake Abbala, was only known by native report. The natives all said their king would be glad to welcome us and trade with us. We were given guides from village to village, and everything seemed to be progressing favourably. But on April 6 all our fond expectations of eternal peace were shattered. I had been out in the morning far from camp with only two boys, and

EREB RIVER, WEST OF BODELE.

had just returned, when I heard a great tumult going on. I rushed out and found that a party of Borans had surprised two of my camel-men, and had killed one and badly wounded another before they were driven off. On looking for my Boran guides, I found they had disappeared. The next morning and the following we marched, but it was through ever-increasing masses of Borans adorned with ostrich feathers. The night was spent with our boots on, and the days in endeavouring to make peace with the natives, at the same time preparing ourselves to withstand an attack. On the afternoon of the third day, however, just

after we had made our camp, between 2000 and 3000 warriors dashed down upon us. Many hundreds were mounted on smart-looking horses. They succeeded in driving off many of our animals before we could check them. The situation looked most serious for us for some minutes. The natives came on with such a rush and in such overwhelming numbers, that many succeeded in getting directly up to our zariba. But we managed to repel the attack, and the enemy were soon on the retreat. At one instant, when a lot of horsemen were collecting near by preparatory to a charge, I handed out a few shot-guns to my boys, loaded with small shot, and ordered them to fire directly at the horses. The effect was magical; the horses were thrown into a panic, and the charge was broken up at once. The attack was scarcely over than the Borans sued for peace, to our great satisfaction. In the course of a week they returned all the animals they had stolen, made presents of honey, milk, and coffee, and received a handsome present from us as a sign of good-will. King Abofolato sent his own son and other relatives to our camp, and everything was settled agreeably to both sides.

The Borans are by far the richest and most powerful natives I met with. They receive many articles of European manufacture, such as cloth, brass wire, and beads, from Somali traders. These Somalis come from the Italian ports, Merka and Magdisha, and exchange their wares for ivory. The principal cloth used by them, however, is made by a tribe called Konso, of whom I shall speak later. They wear a pair of short loose trousers, with a cloak thrown over their shoulders. They are light-coloured, even lighter than the Somalis, and their hair is more wavy than woolly. They are strict worshippers of Wak, and consider themselves far superior to their Mohammedan neighbours. They weigh themselves down with heavy rings of brass worn on fingers, arms, and legs, and cover their necks with enormous strings of beads. With the exception of piercing their ears, they do not disfigure their bodies. The women wear a short skirt made of either cloth or leather, which is their sole garment, but they adorn themselves more lavishly than the men. With the exception of the Gabra, the weapons used by this tribe consist only of a long thrusting spear having a very broad blade. They take a great deal of pride in their horses, and rightly too, as the animals are of a very superior breed. I do not think the Borans number over forty thousand, although reports have informed us that there are millions.

Having escaped the spears of the Borans, we now had to look sharp to escape the horns of that African bully, the rhinoceros, or the sudden charges of an enraged elephant. I cannot blame the elephants for wishing to annihilate me, as I had annoyed them in every case by placing large lumps of lead in tender places about their hearts; but the rhinos had no excuse whatever. Without any provocation, they would suddenly bear down upon the caravan from behind some bush, as if their

lives depended upon crushing every living soul among us, and unless I was ready on the instant to lodge a bullet in the proper place, some damage would surely be done.

On April 16 we were among the Aseba people, a rich tribe of Borans numbering about five thousand souls, long. 38° 16′ E., lat. 4° 43′ N. West of this was a very open, undulating grassy country with scarcely a tree, and sloping gradually to the south and south-west as far as the southern end of Lake Stephanie. But above that point the Tertala range of mountains (5000 feet high), with its broad plateaux, shut in the eastern shore of the lake. It would have been the easiest and most direct way to have marched across this open country to the southern end of Lake Stephanie, but my object was to explore to the north.

After leaving the river Daua, the country we passed through would vary in altitude from 2000 to 4500 feet, with peaks rising 2000 feet higher. South of 4° N. lat. it becomes gradually flatter and lower, and there is less rainfall. There are many evidences of volcanic action, and iron ore is found in abundance, especially to the north-west, as well as coarse granite and mountains of shining white quartz; ammonites are also found near the Daua. Going far up to the north, we came to a black race of people called the Amara, living high up on a mountain, and it was by their village that I was pointed out the grave of Prince Ruspoli, who had come down from the Jub river, the only traveller that had ever succeeded in getting nearly so far into the country. The Amara told me, as eye-witnesses, how an elephant had seized him, and, after tossing him about a long time in its trunk, put him down and trampled on him.

(*To be continued.*)

POPOCATEPETL, AND THE VOLCANOES OF THE VALLEY OF MEXICO.*

By O. H. HOWARTH.

The physical structure of the Mexico valley is sufficiently striking even to the eye of the casual visitor. A vast plain, approximately circular in form and some 15 miles in diameter, including two extensive lake systems, and enclosed by lofty mountain ranges (although its own altitude is over 7000 feet), must have obvious features of peculiar interest. But that interest is, I think, largely increased by certain considerations as to its physical history, which would not be realized without a closer study of the region from various points of view. I do not, indeed, know of any tract of country capable of creating such surprisingly different impressions according to the particular point

* Paper read at the Royal Geographical Society, April 13, 1896. Map, p. 200.

from which it is examined; and it was from recent observations of this peculiarity that I derive the conclusions to be mentioned in these notes.

The very high elevation of these large interior plateaus at a point where the continent is narrowed to a width of only 300 miles between the two oceans, is in itself a remarkable feature. The valley of Toluca, 40 miles south-west of that of Mexico (to which it bears a considerable resemblance), is 9000 feet above sea-level, and is also surrounded by ranges of—geologically speaking—recent volcanic origin. But the peculiarity of the Mexico valley consists in the complete distinction between the character of the ranges bounding it on the north and west, and of those on the south and east. In the former are represented the older porphyries and some of the tertiary sedimentary rocks of the western Sierra Madre; while in the latter the predominance of recent basalts and lavas becomes more striking the more they are examined. The difference even in superficial outline is observable from many points; and though the general conformation of the valley so strongly suggests at first sight its possible origin as a great volcanic centre, it will be seen on further study that the eruptive line has been wholly independent of this particular basin, and that its development in its present form has been, so to speak, accidental.

It must be noted, in passing, that a lofty eruptive cone, terminating in a crater—active or otherwise—does not necessarily represent what may be called a volcanic centre; that is, the original position of a volcanic rift. As a rule it does not. It merely indicates some point on or near such a rift where the presence of water, or some other material developing gaseous matter at high temperatures, has had access to the rift, and has thus given rise to a long-continued explosive discharge of gaseous products, resulting in the building up of a cone of disrupted rock around its vent. The original eruptive discharge, within large continental areas, has frequently taken place without any formation of such cones, until the necessary conditions were encountered. But where a succession of eruptive cones can be observed, they afford a general indication of the course of the rift from which they were derived. If we trace the belt of great cones across this part of Mexico, we shall at once notice in succession those of Orizaba, Malinche, Popocatepetl, Ajusco, Toluca, Jorullo, and Colima, including, with a few others, the highest cones in the Republic, and strongly suggesting (in view of the intermediate formations) a continuous series.

It would thus seem that the main volcanic fissure which at various periods has extended across the continent at this latitude has taken a course nearly from east to west. After examining the eruptive evidences at many points along this line, and especially along the ranges bounding the valley of Mexico on the east and south, it seems to me clear that the primary and largest rift, or vent, passed along the ridge now crowned by the crater of Ajusco; and that, in the then absence of water with

possible access to the rift, the outflow of lavas took place without explosive violence for a long period. Almost the entire mass of the Ajusco ridge consists of a basaltic lava of a singularly uniform character; and the great stream known locally in the valley as the Pedregal has been traced westward nearly to the Pacific coast at Acapulco—a distance of over 200 miles.

The special interest attaching to this vast outflow of molten matter lies in the fact that it is undoubtedly one of the largest continuous masses of recent eruptive rock, derived from one vent, in the known world. This interest is, I think, the greater in view of the fact which has impressed me more fully after each inspection, viz. that all the

POPOCATEPETL.

surrounding cones of eruption along this belt—not excepting even the mighty Popocatepetl itself—must be regarded as subsidiary vents of a later date, from which explosive outbursts took place on the skirts of the Ajusco ridge *after* the enormous volume of matter silently erupted from that original fissure had filled and obstructed its own vent. A visible result of this piling up of material was so to alter the surface conformation as to give rise to accumulations of water at various points, resulting in violent lateral outbreaks wherever it encountered the heated matter and the unspent forces found their line of least resistance. It doubtless is not easy at first sight to regard so gigantic and commanding a cone as that of Popocatepetl as a mere secondary side vent, the offspring of one so much less striking to the eye. Yet the signs that this was the case are to my mind both numerous and convincing. One of

the most remarkable of them is the singularly small quantity of stream-lava definitely traceable to the vent of Popocatepetl itself. Excepting the flow on the south-east flank of the mountain, which terminates at or near Atlixco, only 3½ miles from its foot, I have been unable to find any considerable stream that could be so traced. The great cone I believe to have been built up entirely by the long-continued ejectment of scoriaceous bombs, cinders, and ash, in the course of periodical and violent eruptions of gases and steam after the great lava-flow of Ajusco had subsided. The same feature is observable in the case of the numerous smaller cones of eruption on the same belt. Even the main crater of Ajusco itself, although it rises to an altitude of 13,000 feet and occupies a central position on that range, must, I think, be regarded as a subsequent vent, and not as the original outlet.

Within the valley of Mexico, on the south-east end, are several smaller cones rising from the plain amongst the present lake-beds, and also representing later discharges of vapour and loose material, and not characterized in any instance by an extensive lava-flow. One of the largest of these, called San Pablo, I ascended and examined in November last. It is a prominent mountain near the line of the Interoceanic railway at Los Reyes, towards which village its only lava-stream has flowed. The cinder-cone has an altitude of 9000 feet, being now covered with vegetation. On reaching its summit, I found the crater to be about 300 yards in diameter and 250 feet deep; the interior partly precipitous, and partly a steep slope of scoria and cinder. On the very lip of the crater patches of barley were cultivated, and the evidences of a gradual cessation of the eruptive action, long after the lava-flow, were very distinct. From this summit I was able to observe four other smaller cones along the same line, one of them of such singular symmetry of form as to give one the impression of being an artificial structure. All of these afford the same indications of being "after-vents" of the great Ajusco outlet, in the same series in which Popocatepetl happens to be by far the largest secondary cone.

The two great summits, Popocatepetl and Ixtaccihuatl, forming one range and separated by a pass of about 12,000 feet altitude, are commonly spoken of in Mexico as "the volcanoes," though it has been suggested as long as half a century ago, by travellers who had examined them, that the latter mountain does not belong to the volcanic system at all. I have not been able to obtain any authentic account of an ascent of Ixtaccihuatl. The ridge of which the outline has originated the name (the "White Woman") is very difficult of access, and, being nearly 2000 feet lower than Popocatepetl, does not offer to the ordinary climber the same inducement to attempt it. After making an ascent on the west flanks nearly to the snow-line, I am strongly of opinion that the above view is correct, and that Ixtaccihuatl has no crater, and does not represent any eruptive vent. I found the entire body of the

mountain, so far as I could observe it, to consist of an ancient porphyritic rock of the same character as that of the western Sierra Madre generally, and with no indications whatever, either superficial or otherwise, of erupted materials corresponding to those of the volcanic system. The external structure is quite distinct, the sides of the mountain being deeply serrated into precipitous cañons, separated by lofty porphyritic ridges; and the intervening stream-beds filled with boulders and pebbles exclusively of the same rock. Following one of these gulches from the town of Amecameca almost into the heart of the range for a distance of several miles, I did not observe a single fragment of basaltic or scoriaceous rock in its course.

POPOCATEPETL FROM AMECAMECA.

Following the ranges encircling the Mexico valley northward and westward from Ixtaccihuatl, one cannot but be struck with their wholly distinct characteristics as to contour, weathering of surface, and even the flora produced by them. These ranges are almost entirely devoid of the pine-growth which clothes the mountains on the south, and vegetation is far more scanty. While the cultivation in the valley itself has crept far up the sides of the southern ranges, it is abruptly cut off at the foot of the barren hills on the north side; and on leaving the valley northward this general aspect is maintained all across the range until we descend into Tula, where a lava-stream is again observed, but flowing from the north, and indicating by its greater age and distinctive character a totally different origin. This feature in the history of the two ranges is singularly evident when the northern mountains are observed from any point where the view of the eruptive cones and

lava-ranges is obstructed by intervening elevations, and the valley and its boundaries are only seen in their aspect looking northward.

Summing up these remarks, we can hardly escape the conclusion that, prior to the elevation of the vast lava masses discharged upon the eruptive belt from east to west, the altitude of the land fell gradually from the south of the porphyritic range, and that the continents of North and South America may have been separated by inlets from the two oceans meeting between lofty islands—links in the great chain stretching from Alaska to Patagonia.

The climatic conditions belonging to so extensive a range as that of Ajusco are of course various, and dependent on altitude. The general level of the Mexico valley is over 7000 feet, and the climate, therefore, can hardly be described as tropical in the popular sense. Frost, though very infrequent, is not unknown; and the air-temperature is never oppressive. But it may be remarked that the so-called "region of eternal snows" on the great summits is somewhat mythical. There is, in fact, no "snow-line," even on Popocatepetl, although as a rule both it and Ixtaccihuatl are seen with a snow-cap extending down some 2000 or 3000 feet. This, however, is an extremely variable condition. Whilst climbing the spurs of Ixtaccihuatl in November last, I found no snow at 11,000 feet; on the contrary, the vegetation was abundant and varied—even a delicate maidenhair fern being amongst the products at that altitude. At the same time the cone of Popocatepetl on the south and east side was almost free from snow; and, in the absence of any heavy precipitation later, it is probable that by February (the best month for attempting the ascent) it may have been nearly clear. This, of course, would not be the case in all seasons: but there are occasions when even at 17,000 feet most of the snow disappears.

The melting of the snows at this high altitude is the origin of some very beautiful phenomena, the existence of which has sometimes been contradicted—on account, I think, of the uncertainty of their occurrence during any one season. The direct radiant heat of the sun suffices during the day to maintain a rapid melting, the results of which are of a striking character so long as they remain undisturbed by further snow-fall. Two or three climbers who have made the ascent have described a tract upon which great difficulty was experienced in threading their way amongst crowded ice-pinnacles of such sharpness that their hands were cut and torn in the attempts to traverse them, necessitating the wearing of stout leather gauntlets. Others have stated this obstacle to be imaginary or exaggerated—I have no doubt for the simple reason that on the particular occasion of their ascent the ice-pinnacles were not there. Their formation in certain seasons is due to the rapid consolidation and equally rapid melting of heavy masses of snow; and while, at one period, the continuance of fine weather may have removed them altogether, or a renewed snowfall may have covered up those already formed, at

another the arrest of the melting by cloudy weather and low temperature may retain them in the same condition for several weeks together. During the early part of November last, though unable to ascend as far as the spot, I could examine with glasses a large area of this ice-pinnacled surface on the flanks of the final cone, the whole of the steep declivity being closely studded with shining points of ice, the appearance of which in a brilliant sunlight it is impossible to illustrate by any comparison which would convey an idea of its beauty.

On the north-west side of the cone is a precipitous face of rock some 150 feet in height, where the looser material has fallen away, leaving the perpendicular wall exposed just at the foot of the snow-cap, as it was

CLIMBING POPOCATEPETL.

at the time above mentioned, when I was able to observe it from a point on the pass directly facing it. The mass of snow overhanging this cliff had developed, by partial melting, a solid curtain of icicles in front of it, which I could not estimate to be less than from 50 to 60 feet in length—another transient effect of rapidly varying temperature, the magnificence of which can hardly be described in words, and, owing to the difficulties of access to the spot, can never, I fear, be available to the photographer.

The crater of Popocatepetl lies upon the south-east inclination of the cone, and from below can only be seen from the southern parts of the state of Puebla. Its condition at present, as well as the unbroken conical structure of the whole mountain, indicates a long period of intermittent and gradually subsiding activity, which now appears to have practically ceased. Various records allude to a state of eruption

at the period of the Spanish conquest, and one outburst is said to have occurred about the commencement of the present century. Between those dates, a traveller describes the crater as containing a lake in which fish were found; but the structure of the vent enables us to dismiss this account as fabulous. It is tolerably certain that action had long ceased in the year 1846, when an ascent was made; and I am inclined to regard even the earlier statements with some doubt. The invasion of the Mexico valley by Cortez by way of the pass between Popocatepetl and Ixtaccihuatl, under the circumstances of eruptive action of the former, is questionable, and would at least indicate that it was of no great violence. A minor evidence as to this came to my knowledge as recently as December last, when an Indian discovered on the flanks of the mountain one of the extensive caves which, according to the immemorial custom of the pre-conquest races, had been utilized for purposes connected with the sacrificial worship. In it were found a number of earthen vessels, and the usual clay idols, one of which, a life-sized human figure covered with a curious representation of scales resembling chain-armour, he brought down to the city. The occupation of this cave, immediately below the cone, is not likely to have occurred at any period shortly subsequent to one of severe eruption. Another trivial but curious item of evidence on the same point may perhaps be observed in the ancient local names. A small eruptive cone (now totally extinct) on the skirts of the Ajusco range, bears the name of Chicli (the "hill throwing up sparks"); while the mighty volcano dominating all the rest is only Popocani Tepetl ("the mountain that smokes"). The great ridge from which all this action originated, and the enormous lava-stream flowing from it, are known by no ancient names at all, and only preserve the recent Spanish ones of "Ajusco" and the "Pedregal." If any historical fact is indicated by this, it would seem to be that, while the main eruption and its outflow were never recognized by the ancient population as associated with volcanic energy at all, the great cone was already in a dormant and smouldering condition when its name was bestowed, and only the small lateral outbreak, occurring at a later date, gave them a glimpse of the subterranean fires. The vast quantity of scoriaceous and obsidian bombs scattered far and wide over the plains to the north-east, and of which the renowned pyramids of the sun and moon at Teotihuacan were constructed, were undoubtedly discharged from Popocatepetl. As these pyramids and the city surrounding them are held to be amongst the most ancient remains of human work in Central America, they again confirm the view that the great eruptions must have antedated the period of these names by many hundreds—if not some thousands—of years.

The gradual subsidence of volcanic disturbance along the transcontinental rift pointed out above is an extremely interesting evidence of its original continuity. Of the seven principal vents mentioned, only

one—that of Colima (which, it will be noted, is in close proximity to ocean waters) shows intermittent signs of activity at the present time. It is a familiar fact that accounts of volcanic eruptions—like those of earthquakes and floods—seldom lose much in the process of transmission from one country to another. Frequent opportunities of comparing the reports abroad either with personal observation or the accounts of local residents prove that exaggeration is the rule, and not the exception. Only a year ago statements were published in England of a violent eruption of Orizaba, which I have since ascertained to have been entirely imaginary. The same is the rule respecting the periodical

CRATER OF POPOCATEPETL.

earth-tremors in the Mexico valley, which are apt to recur annually about the close of the rainy season. The only one of any severity for many years past has been that of November, 1894, and even that was scarcely perceived by many residents in the city.

The most remarkable instance of rapid extinction on the volcanic fissure which has split the American continent at this latitude is, perhaps, that of the celebrated volcano of Jorullo, in the state of Michoacan. The sudden outbreak of this extensive vent in the midst of a plain country has been familiar by description to most of us; and its long-continued activity is still supposed by many to constitute it one of the marvels of the natural world. Until I visited the State in October last, I was entirely unaware of its complete quiescence. It was undoubtedly in full activity in, and for many years subsequent to, 1836; but my informant at Patzcuaro, a farmer whose land is on the skirts of Jorullo,

assured me that there is now scarcely a sign of subterranean heat at any point in the entire district. It must not, of course, be assumed that there can never be a re-opening of the same fissure, and fresh eruptive outbreaks on the same line. But the parallel facts in regard to these seven great vents from east to west in Mexico afford, in my view, the clearest indication that they form a continuous chain, having the same volcanic origin.

There is a yet further evidence of the probability that before the formation of this fissure the North American continent sloped towards the south from the general altitude of the Mexican plateaus to the sea-level. When the great lava-bank of Ajusco dammed up the valley of

VIEW FROM CHEPULTEPEC.

Mexico, the natural tendency of the molten mass would be to fall over towards the south side into the state of Morelos, some 2000 feet lower, so that the bulk of it would lie towards that side of the original fissure from which it rose. Hence we should expect to find that any smaller lateral eruptions, occurring later, would find their vent on the north of the ridge; and that, in fact, is precisely what has happened. Nearly all the minor cones are found within the valley of Mexico; and, after careful observation, I have as yet seen but one on the south flanks of the range, in the State of Morelos.

The dimensions of the cone of Popocatepetl have been stated, or guessed at, on many occasions, but have not, I think, been determined with much accuracy, excepting that of the altitude, which may be taken at a little over 17,800 feet. The crater is stated in one account to be 3 miles in diameter, but the absurdity of this is obvious. The

measurement at its mouth is probably about 2700 feet. The depth has been stated variously at from 1000 to 2000 feet; but it is also obvious that any attempt to sound a jagged and irregular chasm such as this, more or less choked at different points of its depth, must be futile. History relates that in the year 1522 an adventurous explorer named Francisco Montaño permitted himself to be lowered into it to a depth of 500 feet. It is to be regretted that he did not leave some record of his experiences, which thus far have little value, except, perhaps, as another indication that at that period no very violent eruptive disturbance was in progress. It is recorded, also, that a party of ten men were deputed by Cortez to make the ascent of a crater in the

IXTACCIHUATL.

neighbourhood of the Mexico valley, which, it may be assumed, was that of Popocatepetl; but in this instance also the only record of interest is that the mountain was then discharging smoke. Successful ascents during the past twenty or thirty years have been not infrequent, though the failures have doubtless been far more numerous. This is due partly to the uncertainty of weather conditions, as the slightest changes in atmospheric currents from either the Atlantic or Pacific side will result in the formation of vast masses of cloud about the peak in an incredibly short time; partly, also, to the fact that the last 5000 feet of the ascent, above the limit of vegetation, must be accomplished entirely on foot; and partly, of course, to the laborious nature of the work at those altitudes.

Along the line of secondary cones east of the lake of Texcoco, in the Mexico valley, the disruption of the ancient porphyries which have been

upheaved near the volcanic belt, can be observed at several points. One of the most interesting of these is the hill of Texcotzingo, about 2 miles south of the town of Texcoco. It consists of broken masses of a porphyry identical with that of Ixtaccihuatl and the ranges to the north of the valley. The existence of this abrupt and rugged pile in its present condition at an ancient date is shown by remains of human workmanship of the earliest period in the valley of Mexico. The relics of two sacrificial temples, with colossal and grotesque idols, two long flights of stairs, a circular bath, and a square tank surmounted by the figure of a gigantic frog, all carved in the solid rock, indicate that, notwithstanding the broken and inaccessible nature of the hill, it was at one time an inhabited spot, and tradition still assigns names to the various sculptures, and a specially sacred character to the locality. Although so near the line of volcanic cones, which includes that of San Pablo, mentioned above, it is entirely external to the more recently erupted matter, and has no trace of such matter upon it. But in a deeply channelled stream-bed 300 feet below, on the south-east, is seen the oldest basaltic lava of the Ajusco series, identical with that which is found in the barrancas near Cuernavaca, in Morelos, some 10 miles south of the Ajusco ridge. In a paper on the "Western Sierra Madre," communicated to the Society last year, I mentioned an instance in Guadalajara as the only example of columnar structure in the basalts with which I was then acquainted in Mexico, and my attention was drawn to the fact that several others exist. In this cañon below Texcotzingo I found an extensive and very beautiful display of that formation. For a distance of more than 100 yards the bed of the stream itself and its precipitous banks consisted of a mass of truncated five-sided and six-sided columns, rising in ranks or steps one above another, in some places with such regularity as to give the appearance of an artificial construction. The origin of this formation, by the gradual contraction of the rock, or rather the release from compression, acting equally in all directions, seems singularly evident in this case. In illustration of it on a smaller scale, I may mention an extremely curious instance which came under my notice in August last, in one of the "Dry Lake" desert valleys of South Nevada. On the level of these valleys an area of several square miles is sometimes occupied by a shallow lake-bed, covered with only a few inches of water during the rains, and in the summer perfectly dry and devoid of all vegetation. The sandy mud of which this floor is composed, owing to the long distance from which it has been gradually washed, and the complete mixture of its materials, is of a perfectly homogeneous consistency over large areas, and becomes so solid under the fiery sun of the summer that a carriage and horses driven across it will scarcely leave a track. At certain points where the last remaining moisture is evaporated, the contraction following upon this baking action produces the cracked surface familiar to every one. Where all

the conditions of material, temperature, level, and evaporation are perfectly uniform, the strain of this contraction operates with absolute equality in all directions, and with most curious results. In the case I refer to, the lake-floor over which I was driving appeared for a considerable distance exactly as if paved with hexagonal tiles, of perfectly equal size, and laid about three-quarters of an inch apart, the hexagons being about 6 inches in diameter. Wherever any of the above conditions became less uniform, the cracking became less symmetrical; but over some portions the appearance was such as must have attracted the least observant eye. At the same time the conclusion as to the identity of

SUNSET ON IXTACCIHUATL.

this action with that which, by a slower but similar process, produces basaltic columns, seems inevitable.

Another singular instance of an angular structure resulting from natural causes, though far different from the above, and less easy to explain, is to be noted in the formation of certain volcanic craters; and I found an interesting example of it in that of San Pablo, near Los Reyes, in the Mexico valley. The mouth or lip of this crater is neither circular nor oval, but distinctly five-sided. The ridge is not level, but its angles are marked by five peaks, or rounded elevations with depressions between each, having the outline of a festoon from one to another. I have noticed this formation in other craters elsewhere (but not of the same symmetry), and have attributed it to the changes of wind during the eruptive action driving the ejected material to one side or another; but the case of San Pablo does not seem to me so easily accounted for in this way, as the five elevated points are all of more or

less solid scoriaceous rock, and not of loose cinder. I am unable, however, at present to suggest any other reasons for this peculiar structure.

While making my way over the 4 or 5 miles of exceedingly rugged lava which has flowed from this cone to Los Reyes, I was again much struck with a certain mechanical process which I have more than once suggested as the origin of the loose-boulder pyramids on which it was so frequently the habit of the ancient Mexicans to erect their sacrificial temples, or "teocallis." It is difficult in most cases to suppose that any original design led them to undertake the enormous labour of raising the great pyramids and mounds with this small material.

Owing to the fertility of the decomposing lava, every opportunity has been taken on the San Pablo stream to clear and plant plots of ground amongst the rocks, wherever there is the least chance of so doing. These plots are naturally made square, or as nearly so as the surface will admit, and in clearing them the small boulders and stones are deposited in a heap at the nearest convenient spot. As the adjoining square plots increase in number around this spot, it becomes by common consent the depository of loose stones, and is also approximately square. Even as it increases in height, and the stones have to be carried up its sides, the labour is less than that of conveying them a long distance. Thus commences the construction of what may be described as an unintentional pyramid, which in the course of years may assume very large dimensions. It is easy to suppose that in early ages this may eventually have suggested its completion for the purpose of rearing on its summit a temple devoted to the worship of that sun to which the success of all this toil in cultivation was primarily due. On the lava-stream of San Pablo I found two or three such undesigned pyramids actually in course of construction, though doubtless they will never now be devoted to that object.

One can hardly dismiss the subject of Popocatepetl and its colossal neighbour Ixtaccihuatl without some reference to the impression created by the scenic aspect of these magnificent snow-summits under favourable circumstances. It would be hard, I think, to discover in the world a scene more sublime than is presented for an hour before and after sunset, from the terrace of the "Holy Mount" of Amecameca, facing the two great mountains. It is one for the enjoyment of which neither scientific nor technical knowledge is needed; and few who have witnessed it can recall it without an afterthought that for that one sight alone life has been worth living.

Before the reading of the paper, the PRESIDENT said: We had the pleasure last year of listening to a paper by Mr. Howarth on the Sierra Madre of Mexico. This evening he is going to give us what will be, I think, a very interesting account of Popocatepetl and the volcanoes of the valley of Mexico. I will now ask him to read his paper.

After the reading of the paper, the following discussion took place:—

Mr. Wilfrid Amor: First of all, I have to offer my thanks to Mr. Howarth for his address. As regards the theory of the formation of the valley, I think there can be no doubt about it that the general idea of Mr. Howarth is perfectly correct. Nevertheless, I believe that there is some importance to be attached to the general fact that these valleys of Toluco, Mexico, and Puebla, and the valley of Morelia still further to the west, lie parallel to each other, and to the ridges between them, and are longer in the north and south direction than in the east and west. That seems to point out, I think, to their being formed by the crumpling up of the surface of the Earth in a general direction parallel to the Sierra Madre, Rocky mountains, and the Andes. A very interesting point is the question of the age of the rocks. He has pointed out that on the north and west of the valley of Mexico they belong to the older formations, whereas on the eastern and southern boundaries they belong to the Tertiary, or more modern formations; that might perhaps militate against the idea of all the valleys being formed by the folding and wrinkling of the surface. But I think, considering it a little more carefully, the antagonism will only appear to be superficial, because the masses of rock will be thrown out on the line of least resistance, and the cone of Popocatepetl would be, as Mr. Howarth pointed out, one of the more recent ones. Mr. Howarth has remarked that Ixtaccihuatl and Popocatepetl are both called volcanoes. It is only an instance out of many in which the original words in Mexico have lost their true meaning. To the average Mexican in Mexico, "volcano" means "a snow-capped mountain" more than a vent of volcanic action. Thus the mountain of Colima is known as Volcan de Fuego, others are called volcanoes. Another interesting point is, that the crater is inclined towards Atlixco, and the inclination, in so large an opening, deludes those who ascend the mountain into the belief that they have reached the summit when they have attained the lower lip and look over into the crater, whereas there still remains a long climb. With regard to the nature of the soil in the valley of Mexico, there are some remarkable points which I don't think have been put on record before. One is the extreme lightness of the soil of which the valley is composed. I had occasion to have a cubic foot weighed on several occasions in different parts of the valley, and it was found that at from 1 to 5 metres in depth, the weight of 1 cubic foot was 73 lbs., and only 57 lbs. when dry. It shrank about one-eighth of its volume; so really the specific gravity was practically the same as water, between 62 and 64 lbs. At 5 metres' depth, the weight of the material was only 47 lbs., which is lighter than water, and it shrank 5½ inches in depth over the whole cubic foot, very nearly one-half, and then the weight of the remainder was 21 lbs., which would make the cubic foot a little less than 40 lbs., two-thirds of the weight of water. This material extends to the depth of about 60 metres, as has been found out by sinking artesian wells. It is well known that the earthquakes or earth-tremors were very frequent and severe in the valley of Mexico before twenty-five years ago. They have become very much less frequent and very much less serious ever since artesian wells were sunk in the valley. Finally, I have in my hand a rather curious specimen. It is an egg that was found at a depth of 4½ metres in the valley of Mexico. I don't profess to know what species it belongs to; it is not a fossil, but it was found with four others, three of which were sucked by the Indians who discovered them, and it was perfectly full of liquid at the time and very heavy. Now it feels more as if it had been blown; but, as will be seen, it has no pin-holes. The moisture gradually evaporated in that very dry climate. The remarkable fact is that the egg was found at a depth of 4½ metres, and at a depth of 1 metre there is throughout the valley a hard layer of marl, of varying hardness and

thickness, from 6 to 18 inches, and the hardness is such that in some places it requires a pick to dig it out, while at other places it crumbles in the hand. In general it is very hard. This egg was found 2 or 3 metres below that hard layer. At a point not 20 kilometres from where this egg was found, above the marl, there has been discovered the perfect skull of a mastodon, besides other remains. Now, that would indicate that this egg was laid long before the mastodons had left the neighbourhood, and I believe the species still exists from which this egg came. Its age I leave wiser heads than mine to discuss.

Father JOHN GERARD: I am afraid I cannot say anything on my own authority about the egg, but I took it down to Mr. Bowdler-Sharpe, and, after some investigation, we came to the conclusion that it is the egg of the *Pelicanus erythrorhynchus Americanus*. The American pelican is still extant, but, it would seem, was in existence before the mastodon became extinct. The appearance of the egg tends to show that it was originally laid in a salt marsh, and I fancy the saline liquid found in the egg was water from that salt marsh. Mr. Amor mentioned to me, that as it evaporated it did so with a hissing sound, which he heard in the drawer in which it was kept. It can scarcely have been the original yolk and white which the Indians sucked.

Mr. GEORGE T. PRIOR: As Mr. Howarth has been good enough to place under our keeping at the Natural History Museum many of the rock specimens which he collected in Mexico, I need scarcely say that I have listened with great interest to the paper to-night, in which he describes the geographical features of the country from which those specimens came. As I have never had an opportunity myself of visiting Mexico, the few remarks I should like to make must be purely from the museum point of view, and rather of petrological than geographical interest. First, by way of mild criticism, I cannot help thinking that Mr. Howarth is inclined to lay just a little too much stress upon the differences in outward aspect which he noted in the field between what he calls the older porphyries and the more recent lavas. From an examination of the hand specimens which we have at the Museum, I cannot help concluding that the so-called porphyries are lavas, equally with those of Popocatepetl. As Mr. Howarth has pointed out, they certainly present striking differences in outward aspect, but they both belong to that type of igneous rock, to which the name of andesite has been given, owing to its prevalence in the Andes. They differ, however, so far in chemical composition that the lavas of Popocatepetl are more basic, dark, and somewhat glassy hypersthene-andesites; while the lavas of Ixtaccihuatl are lighter and more porphyritic, horn-blende andesites. Of course, I cannot say anything as to the relative ages of these two lavas. Mr. Howarth may perhaps be able to give us a little more information on that point. The ridge-like appearance of Ixtaccihuatl, and the absence of any definite crater, suggest that its lavas may possibly have been erupted by a quiet fissure eruption, somewhat similar to that which gave rise to the enormous lava-flow from Huasco, described by Mr. Howarth. In this connection, it may be of some interest to mention that in earlier stages of the Earth's history there have been flows of lava beside which this Huasco flow sinks into insignificance; for example, the Deccan basalts of India attain a thickness of about 4000 feet, and are estimated to cover an area of 200,000 square miles. Before I sit down, I should like to say that at the Museum we owe a debt of gratitude to Mr. Howarth for the great trouble he must have taken in collecting and bringing home the excellent specimens which are now deposited in the Museum. I shall be only too glad to show them to anybody who may be induced by the interesting paper which we have listened to to-night to come and see them.

The PRESIDENT: We have to thank Mr. Howarth for an exceedingly instructive

paper, suggesting a great number of very interesting points, but I wish, before proposing a vote of thanks to Mr. Howarth, to make a few remarks on the subject of the first recorded eruption of the great volcano of Popocatepetl. I understood Mr. Howarth to say that an actual eruption of fire and red-hot stone had not taken place for many hundreds of years. Now, that charming old writer, Bernal Diaz, a soldier in the army of Cortes, describes with great minuteness the eruption the Spaniards saw from a short distance, when marching to Mexico. He says, "A great column of smoke rose straight into the air to a considerable height, and then spread out as a large cloud." But he also says, "With this smoke there was to be seen flame in various directions, red-hot stones being thrown up in great quantities and with violent explosions. The people," he says, "were terrified, not at the smoke, which was of very common occurrence, but at the flames and red-hot missiles flying out of the crater, which they had never seen or heard of before. They believed that the tyrants who had been cruel to them were being roasted in that volcano, and consequently they were horrified when they beheld these fiery tyrants flying out of the crater and spreading over the earth." When Diego Ordaz, a companion of Diaz, volunteered to examine the crater, the Indians whom he asked to come with him positively refused to go beyond a certain place, which they called the cave of their gods. There they stopped, while Diaz and his companions pushed on. When they got near they felt most violent tremors of the earth, accompanied by a pouring out of flame and missiles, and they hid themselves or sheltered themselves from its violence in some of the crevices of the rocks; but when this lulled they pressed onwards, and did reach the lip of the crater, looked down, and saw a mass of fire below, and it is particularly interesting that when they returned to Cortes with a report of this eruption, they brought with them some of those great icicles which Mr. Howarth has described. Now, with regard to the second ascent ordered by Cortez, which was conducted by Montano, we must recollect that Montano, so far as we know, never said he was lowered down 500 feet. The only person who said so was Don Antonio Herrera. If Montano said that he was lowered down 5 feet, Herrera would be quite likely to say that he was lowered 500 feet. I can see nothing extraordinary in the fact that, when ordered to collect sulphur, they may have been lowered down in a basket to scrape the inner surface. Bernal Diaz further mentions that there was a second great eruption twenty years afterwards, in 1539. I will not detain you longer with further remarks, but I am sure that the meeting will wish me to return most cordial thanks to Mr. Howarth for his interesting paper, and for the way in which he has illustrated it, and especially for showing us that gigantic tree at Oajaca, although, as he said, it has nothing to do with the volcano of Popocatepetl.

THE CENTRAL CAUCASUS.*

FROM time to time, while Mr. Douglas W. Freshfield was engaged in opening the Caucasus to European mountaineers, he has communicated to the Royal Geographical Society reports of his journeys, which have appeared in the Society's monthly publication; and his first visit was treated at greater length in 'Travels in the Central Caucasus and Bashan,' published twenty-seven years ago. Now when the fruit of his sowing has to a large extent been gathered in, and when relief from

* 'The Exploration of the Caucasus.' By Douglas W. Freshfield. With illustrations by Vittorio Sella. London: Edward Arnold, 1896. 2 vols. Maps and plates.

the many official ties which bound him to the science of geography and the sport of mountaineering has been earned for a time, Mr. Freshfield has brought together the material for two monumental volumes, which are placed before the public in a form more splendid than any other book of recent travel can boast.

The refined and scholarly literary style of the text is Mr. Freshfield's own; the illustrations of unexampled beauty are transmitted direct from Nature through Signor Sella, whose name deservedly shares the title-page, and the skilful German photo-engravers who have reproduced them, enhanced in clearness, if that be possible, and disfigured by no trace of retouching or "artistic improvement." With these photographs and the new map of the Caucasus, drawn by Mr. Reeves, the reader is more nearly in the position of an actual traveller than the reader of a book of travel ever was before. To study one of the long panoramas in conjunction with the map is to seem to see the mountain system itself, with its forests, rocks, and snows, its lofty passes and deep-cut valleys, tenanted by the strange remnants of peoples who make their last stand there against the inevitable absorption into Europe.

While the illustrations are beautiful in themselves, and form a gallery of mountain pictures which it is a pleasure for the least instructed to pore over, their chief value lies in the fact that they are in the truest sense illustrations, supplementing the written description, and enabling it to tell its story with additional effect.

The design of the book is thus stated in the preface, after reference to the varied sources of the work: "In these volumes I have endeavoured to bring together some of this miscellaneous matter, and to make my chapters such a series of sketches of the Central Caucasus, its scenery and its people, as may stir pleasurable memories, or anticipations, among travellers, and also interest that great body of readers who love mountains and like to hear about their exploration. The arrangement of the book is in the main topographical; that is to say, I have abandoned chronological order and continuity in the narrative of particular journeys, in order to bring together the facts concerning each district, or portion of the chain, into single or consecutive chapters. The method has its drawbacks; but on the whole these have seemed to me, in the present instance, to be more than counterbalanced by its advantages. The record of adventure may be less vivid, but the pictures of the country and its people should gain in definiteness, and it ought to be easier to select characteristic facts from among trivial details."

The contents of the work are divided into chapters, each of which has some special interest of its own. In the first, on the discoverers of the Caucasus, the curious errors which long clung even to geographical writers on this range are exposed and criticized with no little humour, and with a sensation of sarcasm held in check. The belief generally

held up to thirty years ago, and often expressed since, that there are no glaciers in the Caucasus, gives occasion to some caustic remarks on the fatuity of scientists; but Mr. Freshfield is careful to explain that in his use of the term *scientist* bears the same relation to *man of science* as *poetaster* does to *poet*. The story of how the Russian surveyors were induced, by the action of English climbers, to extend their survey to the snow and ice-covered regions of the chain, brings into prominence one of those instances in which geography, perhaps even geodesy, has been directly advanced by the influence of mountaineers. The second chapter summarizes the characteristics of the Caucasus as a chain, dwelling on the important fact, so often lost sight of, that the watershed does not in all cases correspond with the axis of greatest height, and pointing out how the scenery varies in response to the change of geological structure from north to south across the chain, and how the transverse gorges are cleft clear through all the formations right down to the roots of the mountain. The area and length of the glaciers, as measured on the new Caucasian survey maps, show that the greater glaciers have, as a rule, a larger area in proportion to their length than those of the Alps, while in length only the Aletsch glacier of the Alps exceeds those of the Caucasus.

Of all features in which the Caucasus asserts its supremacy over the mountains of Western Europe, its remarkable vegetation comes first. For colour and quantity, for size and splendour, the flowers of the lower valleys are unequalled in the temperate zone, and the close contrast of blossom and snow-field inspires many passages of gorgeous description.

A third introductory chapter on Caucasian history and travel leads on to the detailed description of the several regions into which the Central Caucasus is naturally divided. Kasbek, a "solitary classical mountain," the first great summit scaled by Mr. Freshfield in 1868, to the incredulity of the Russians who welcomed his descent, appropriately takes the first place; but the description of the Ossete region in which it lies possesses a value far above that usually attained by stories of a first ascent. The Mamison pass and Gebi, the Adai Khokh group, the valley of the Urukh, Balkar and Bezingi are passed in picturesque review, and a series of fascinating chapters follows with the description of Suanetia. Nowhere else has so remarkable a community been preserved intact in the strong rooms of the mountains until the latter part of the nineteenth century as here in Free Suanetia. Now the valley is, under Russian discipline, yielding to the conventionalities of Western civilization; but when the small party of English mountaineers dropped into it from the outer world nearly thirty years ago, it was as fresh and wonderful to them as they were to the picturesque banditti dwelling in towers along the Ingur. Of the mountain summits which guard the head of this wonderful valley, these volumes tell us much, of Ushba and Shkara, whose stately forms are depicted in every variety of atmospheric

condition, and of Tetnuld, the ascent of which is described in a chapter by itself. It was during his visit to the Caucasus in 1887 that Mr. Freshfield made the pioneer ascent of "the gigantic pyramid of Tetnuld." With this mountaineering triumph the first volume ends.

The second volume describes many peaks and valleys, but several of the records are from the pens of fellow-mountaineers, and the necessary change of literary style somewhat mars the unity and homogeneity of the work. Thus the exploration of Dykhtau and Katuintau is described by Mr. H. W. Holder; that of Shkara, Janga, and Ushba, by Mr. J. G. Cockin; the ascent of Koshtantau, by Mr. Hermann Woolley; and the sources of the Kuban, by M. Morice de Déchy.

The chapter of deepest human interest is unquestionably that entitled "Search and Travel in 1889," which recalls the sad fate of Messrs. Donkin and Fox, and recounts the journey of search which Mr. Freshfield and Mr. Dent undertook in order to clear up the mystery surrounding the disappearance of those climbers. It was with a satisfaction which all who read of the natives of the Caucasus in this book will share, that the searchers found indisputable proof of the fatality having been a pure accident, and so cleared the people of the Caucasus from the suspicion of having murdered the strangers.

A chapter on the solitude of Abkhasia concludes the book; and it gives an opportunity for some excellent advice to climbers not to degenerate into gymnasts, but to make full use of their opportunities in mountain exploration, not for observation only, but for contemplation as well.

As Appendix A, Professor Bonney gives a valuable "Physical History of the Caucasus," giving a complete summary of the geology of the range, illustrated by a geological map. In Appendix B there are lists of the peaks and passes along fourteen routes, with distances and particulars as to resting-places, and notes on previous climbs. Appendix C contains some meteorological statistics for 1890, which would be of greater value if the figures had in all cases been means of several years; D gives some statistics as to Caucasian glaciers; E contains notes on the maps and illustrations; and, finally, Appendix F is a brief list of the more important books relating to the range.

One feature in the binding of the volumes must be noticed with special approval. It is the manner of carrying the large folding map in a recess of the cover, which is much more convenient and less unsightly than the plan of placing the map in a pocket or under a strap of paper. The printing of the process-blocks is, like that of the photogravures, exceptionally successful.

THE GREAT SEA-WAVES IN JAPAN.

By Professor JOHN MILNE, F.R.S.

JAPAN, in her recent war with China, lost some 5000 soldiers. In 1891 an earthquake originating in the central provinces resulted in the death of about 10,000 of her people. Now we learn that on June 17 the north-eastern shores of this same country has been devastated by huge sea-waves, and 27,000 lives have been sacrificed to swell the list of those who in previous years perished in like manner. To the south of the devastated region, nestling amongst sand-dunes and crooked pines, is the village of Kamakura, which in ancient times was a Shôgun's home, the capital of the empire, with a population estimated at a million. Often was this city sacked and laid in ashes, but the most terrible disasters to which it was subjected, and which eventually resulted in its abandonment, were earthquakes and great sea-waves, which, for example, in 1293 carried away 30,000 of its inhabitants. All that remains to attest to the former glory of this ancient capital is the huge bronze Buddha, so well known to all who sojourn in Japan, which yet sits upon its massive pedestal and with its calm eyes of gold looks out upon the broad Pacific, the home of the sea-god which has so often created devastation round its feet.

To the south of Kamakura we come to the coasts of Shikoku and great cities like Kochi in Tosa and Osaka, the histories of which are filled with stories of similar disasters. In 1703 we read that on the coasts of Awa the number of those who lost their lives exceeded 100,000. Without multiplying instances of these great catastrophes, more terrible in their results than war, a glance at the localities where they have occurred shows that they have been without exception confined to the eastern seaboard, where the land suddenly sweeps downwards beneath the deep Pacific. Along the line of this submarine slope, which forms one of the largest and sharpest contours on the surface of our Earth, earthquakes are frequent, and from a study of these we are led to the conclusion that if a monocline is the home of faults, it is also the birth-place of the seismic disturbances, violent shakings accompanying which are so often felt along the coast. It seems probable that in a north-west to south-east direction this mighty fold is intersected by a puckering which is the submarine continuation of the anticline forming the backbone of Yezo. From the times at which shocks have been noted at different points along the eastern seaboard of Japan, arriving first at harbours along the shores which have been recently inundated, and later at places lying farther to the south, approximate determinations of the positions from which these have emanated have been made, and we are led to the conclusion that the Yezo anticline is yet in process of construction, and a submarine range of mountains may be slowly growing upwards.

The dress which mother Earth is slowly drawing round her shrinking body is composed of stiff materials, and as she takes in a seam or gathers in a tuck, this often happens with an angry rend. The extent to which rocks will bend is limited, and if the forces causing bending continue to operate, it is followed by a sudden fracture. The earthquake of 1891 was the result of a fracture perhaps 60 miles in length, the result of which was that the country, which included lines of mountains on one side of this, suddenly fell downwards, relatively to all upon the

other side. The sudden displacement and subsequent settlement of this material caused the shakings which in that year destroyed two of the most fertile provinces in Central Japan. If we transfer these conditions to a line on the face of the Pacific monocline, and imagine that on June 17 bradyseismical folding exceeded the limits of elasticity, that this was followed by a gigantic fracture and large displacements in the rocky crust, even if these were only half of those which we can see to have happened in Central Japan, it seems reasonable to suppose that such violent changes would be sufficient to cause not only a mighty earthquake, but also a great disturbance in the waters.

That great earthquakes with a submarine origin have been accompanied by sudden changes in the form of an ocean bed is well known to those who, like Mr. W. G. Forster, of Zante, have had the charge of submarine cables near earthquake regions. A great earthquake has occurred, a cable has been broken at two points, and between these points soundings have shown that there has been so great an increase in depth, that, rather than attempting to lay a new cable along the old line, a line has been chosen round the site of the disturbances.

From these remarks, it must not be assumed that all sea-waves are the announcement that changes which are usually too slow to be apparent in a lifetime have taken place suddenly, because we have abundant evidence to show that they have sometimes resulted from submarine landslips, and often from volcanic explosions. The sea-wave which in 1883, which was the year of the red sunsets, inundated the coasts of Java and Sumatra, causing a loss of 36,000 lives, originated in the latter manner, as also did the Peruvian waves of 1868 and 1877, the effects of both of which were felt upon the coast about which we particularly write.

The reason that we incline to the belief that the Japan disaster was of a seismic rather than volcanic origin, rests on the fact that its origin appears to have been near to origins from which destructive earthquakes have often been recorded; that the contour of the sub-oceanic crust off the north-east coast of Japan is one where sudden yieldings might be expected; and, lastly, upon a piece of information which, to those who have not closely followed the developments of seismology, may appear both strange and wonderful.

In the Isle of Wight, at the little village of Shide, an exceedingly delicate seismograph has been established, which day and night photographs the slightest movements in the pier on which it stands. The installation is so located that it is not interfered with by vibrations produced by railway traffic and other artificial disturbances. A little after 9 o'clock on the night of June 29 this instrument was suddenly disturbed, showing at least five maxima of motion during the next hour. This was the record of an earthquake which had taken place in Cyprus, about which we read a brief telegraphic notice in the papers on the following morning.

As to whether the Japan disturbance sent an earth-message to Europe we are doubtful. If the destruction in that country occurred on June 17, as telegrams inform us, the answer, so far as we yet know, is negative, and therefore the sea-waves of Japan were not accompanied by any extraordinary earth-shaking; but if the disaster happened on the day previously, then earth-messages of a very distinct character were received in Europe. The first announcement reached the Isle of Wight and in Italy on the evening of June 15, while in the latter country messages were pronounced at about five and nine in Japan time on

the following morning.* On this day, therefore, it is certain that tremors announcing a great convulsion were passing round, and possibly *through* our Earth, whilst telegrams tell us that on the following day there had been a great disaster in Japan. Whether these refer to the same or to different catastrophes, it is not yet possible for us to decide. Assuming the substance of the telegram to be correct, what we do know is, that a sea-coast has been devastated, 27,000 lives have been lost, whilst 8000 destitute and wounded survivors remain to tell the story of a national calamity.

By her contributions to art, Japan has given pleasure to the world; the gentle manners of her people, her victories, and her progress have called forth the praise and admiration of all nations; and now, in the time of affliction, she seeks that sympathy which it is within the power of every one to offer.

Since the above was written, the following information has been received:—

"It seems clear that the wave originated at a short distance from the Japan coast, which here tends in a north-easterly direction from the northern port of Sendai, halfway between Tokio and the island of Yezo or Hokkaido. Some displacement of the ocean bed about the southern edge of the great Tuscarora Deep probably caused a disturbance, the western section of which, in the form of a sea-wave, 80 feet in height at some points, impinged upon an extent of coast-line some 300 miles from the south-west to north-east. The far-famed Matsushima Archipelago, the exquisite scenery of which is yearly visited by many foreigners, lay just outside the southern limits of the wave, but to the north all is now ruin. From Kinkasan, the northern island of the archipelago, the coast is fiord-like in character, abrupt mountain ridges run down almost to the water's edge, and in the bays and estuaries that interrupt the shore-line several important towns and many fishing hamlets were situated. With a few exceptions these have been destroyed—notably the town of Kumaishi, 10 miles distant from the iron-mines of that name, of whose 6000 inhabitants very few survive."

The above extract shows the reliability of seismographic records. Although newspapers told us that on June 17 there had been great sea-waves in Japan, instruments in Europe indicated that on that day the earth was at rest, but that there had been violent movements commencing some two days previously. The surmise was that there had been errors in the telegraphic information, and that this was so and that the seismographs were correct is now established. We have here one good illustration of the benefits which might be derived if a geodynamic observatory were established in the British Islands.

* The reason that no records were obtained at Shide on this morning was, that on that day the instrument was dismantled for adjustment similar to those of an instrument which, by kind permission of Mr. A. Harbottle Escourt, the deputy-governor of the island, was then being installed at Carisbrooke Castle.

THE CENTRAL ASIAN EXPEDITION OF CAPTAIN ROBOROVSKY AND LIEUT. KOZLOFF.

THE work of exploration of Central Asia, prosecuted for years in succession by the late Prjevalsky, was not abandoned by the Russian Geographical Society after his death. In the years 1889–90 a new "Tibet Expedition" was sent out under General Pevtsoff, and it included the two habitual companions of Prjevalsky's last journeys, Captain Roborovsky and Lieut. Kozloff, as well as a geologist, K. Bogdanovich. This expedition went from Zaisan southwards, crossing the Tarbagatai region, the Eastern Tian-shan, and then, following the western boundaries of the Hashun Gobi desert, it reached and crossed the border range of North Tibet, the Altyn-tagh, penetrating into the highlands of Tibet as far as the 38th degree of north latitude in the meridian of Lob-nor. Thence the expedition went westwards, along the northern foot of the Altyn-tagh border range, which was explored during several excursions directed southwards, and then it returned to Russian Turkistan *viâ* Khotan, Yarkand, and Kashgar. Two volumes of reports, accompanied by an excellent map (67 miles to the inch) and detailed geological maps, were the result of this expedition.

In the year 1894 a new expedition was equipped, with the same purpose. Roborovsky and Kozloff were again members of that expedition, the leadership of which was placed in the experienced hands of Roborovsky, whose acquaintance with Central Asia dates from 1879. A teacher of natural sciences, Ladyghin; a preparer of zoological specimens, Kurilovich; and six Cossacks and noncommissioned officers, mostly also members of previous expeditions, joined the two indefatigable travellers. The aim of the new move was to proceed from Russian Turkistan south-eastwards, and to explore and to map, first the Nan-shan highlands, explored at the same time by the geologist, Obrucheff, and then to penetrate, so far as possible, into the highlands of the upper Hwang-ho, into the outskirts of which Prjevalsky had made two incursions. At the same time, it was intended to explore, and to determine, by means of barometrical observations covering a considerable lapse of time, the altitude of, the remarkable Lukchun depression, which, as had been discovered by the brothers Grum Grijimailo, lies below the level of the ocean, although it is surrounded by high plateaus and mountains.

This last task, and especially the much more difficult task of a detailed exploration of the Nan-shan highlands, were admirably accomplished by Roborovsky and Kozloff. Following Prjevalsky's method, the expedition chose stations (at Lukchun, Sa-chu, in the north of the Nan-shan, and Kurlik, in the south of the same highlands), leaving there M. Ladyghin and some of the men, while Roborovsky and Kozloff, accompanied by one or two only of their travelling companions, and often without a guide, with no more than one or two camels besides their riding-horses, undertook excursions in the surrounding mountains and deserts. Several such reconnoitring expeditions were undertaken in the midst of terrible winter, such as reigns at altitudes of from 10,000 to 14,000 feet amidst high snow-clad mountains. By means of such excursions, each of which was equivalent to a good journey—400 to 500 miles being covered and surveyed each time—Roborovsky and Kozloff succeeded in exploring in detail immense tracts of unbroken land. But the privations of the winter journeys told upon the health of Roborovsky; and when the expedition, making its last move south-eastwards, was at the foot of the Amnemachin snow-clad mountains, beyond which the bend of the Yellow river lies, Roborovsky was overtaken by a stroke of paralysis, from which he has not quite recovered, and the expedition, surrounded by gangs of Tangut robbers, had to return—a circumstance which the Tangut riders took advantage of at once by attacking it. The

party thus returned to Kurlik, then to Sa-chu, and thence, *viâ* Dzungaria, to the Russian town Prjevalsk, on the lake Issik-kul, after having been out from August, 1893, to December, 1895.

The routes of the expedition can be best followed on the map which accompanies Prjevalsky's last journey, while its exploration of the Nan-shan is best seen on the map of this region which is given in the last number of the *Izvestia* of the Russian Geographical Society (1895, fascicule 5). Both Roborovsky and Kozloff wrote, during their journeys, long letters to the Russian general staff and to the Russian Geographical Society; and these letters, in which Kozloff gave splendid descriptions of the nature and fauna of the regions visited, were partly printed first in the St. Petersburg military paper *Russkiy Invalid*, and then reproduced in full in the *Izvestia* for the years 1894 and 1895.

In the following condensed record, separate headings are given, which will render it easier for the reader to follow Roborovsky and Kozloff in their two years' travels. Their reports concerning the exploration of the Nan-shan have been somewhat shortened, as their work will be better understood when it is taken together with the geological explorations of the same highlands made by Obrucheff. The Russian geologist's sketch-map will also give a better general idea of the structure of the various ridges and valleys of which these highlands, rather monotonous in their physical characters, are composed.

From the Russian Frontier to Lukchun.

The expedition left the Russian frontier on August 8, 1893,* at the hamlet Okhotnichiy (Hunters'), east of Lake Issik-kul, its primary intention being to cross the Khan-Tengri mountains on its way south-eastwards. They soon had, however, to abandon this plan, and move towards the Yulduz plateau (on the Haidu river, tributary of Bagrach-kul) by following the Tekes. This river, as is known, is separated from the Yulduz by high snow-clad chains which run east-north-east and may be considered as a continuation of the Khan-Tengri chain.

The valley of the Tekes, peopled by Olyut Kalmuks, who carry on some agriculture and trade in cattle with Kashgaria and Kulja, is very attractive, owing to its rich vegetation. But the explorers had soon to leave it and to enter the mountain region; they followed first the Koksu, a tributary of the Tekes, and next crossed the two parallel snow and glacier-clad chains. The two passes across the two chains (Mukhurdai, 12,000 feet, and Sari-tyur, 11,000 feet) offered no difficulties, especially the second. Beautiful glaciers descended on all sides, surrounded by old moraines, and tempting the travellers by the easiness of access to the frozen ice-streams. Then a third pass, quite smooth and flat, covered with a marshy meadow vegetation, and only 10,000 feet high, brought the travellers to the Yulduz plateau.

The Great and Small Yulduz plateaus, 8000 feet above the sea, are the bottom of an Alpine lake. High mountains, all snow-clad, surround them on all sides. The Khaidik river (also Haidu-gol) pierced at last the 12,000-feet-high mountains in the south-east, and emptied the lake; it now flows through a gorge 5000 feet deep, while the bottom of the old lake is covered with a comparatively varied vegetation and with rich meadows of steppe grasses, and is inhabited by a great number of stags, argalis, roe-bucks, boars, wolves, and foxes—the latter being renowned for their soft and thick fur—as well as by countless aquatic birds nesting in the ponds and marshes.

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* All the dates in the following are given in the New Style.

Turgut Mongols, who came some two hundred years ago from Russia, have taken possession of the Yulduz. They have protected themselves from the Kashgarians by rendering impracticable the three passes which lead across the high Kok-tepe mountains towards the south-west, and they receive only the Dungan and Sart merchants, whom they know. Four very easy passes open a communication towards the north-west, across the snow-clad Narat mountains. The Yulduz Mongols are governed by their own khan, and hate the Chinese, whom they accuse of having poisoned two of their khans. Their numerous herds of sheep and their excellent horses prosper at this height, where no torrid heat is known in the summer, while the western winds keep off the insects.

Through a Buddhist priest who knew and liked Prjevalsky, and who had been called in by the Yulduz Mongols to pray for their delivery from a throat disease, Roborovsky and Kozloff obtained the necessary guides—the latter for a journey to Kucha, in Kashgaria, and the former for continuing his journey south-eastwards, to Karashar and Lake Bagrach-kul, or Denghiz.

The expedition went down the Khaidik-gol, accompanied in the most friendly way by the Mongols, who saw in them friends of their priest. But, the bed of the river being soon narrowed by the crags, they had to leave it and to travel on the ravine-cut plateau, into which the river dug its bed; and well it deserved, in the next 60 miles, its name of "Seventy passes" (Dalin-daban), as the route had continually to cross the several-thousand-feet-deep ravines cut in the 10,000 to 11,000-feet-high plateau, composed of various slates. But, the land gently sloping westward, they soon came to a more open region, of red sandstones, conglomerates, and slates; and on a tributary of the Khaidik-gol (Tsagan-usu) they found a stone wall which once crossed the 5-mile-broad valley, and served to protect, three centuries ago, the Mongols against the raids of the Dzungarians. Turguts from the Yulduz stay here in the winter, while some of the poorer ones are settled permanently, and grow some millet, wheat, barley, and flax, as also some water-melons, melons, and vegetables. Many ruins, dating from the Dungan rising, covered the wide, flat, and fertile country—a former bottom of Lake Bagrach, or Bagrach-kul.

The expedition, however, did not follow the usual route which leads from Karashar to Turfan. After having been rejoined by Kozloff, they went northwards and then south-east, in order to explore the narrow valley of the Algo river. They reached the Lukchun depression at Toksun on October 5, and then they went by different routes to Lukchun.

The Lukchun Depression.

This remarkable depression was made, for the next two years, a sort of basis for the expedition, and a meteorological station was installed in it at Lukchun. It covers nearly 100 miles from west to east, and from 50 to 55 miles from the southern foot of the Eastern Tian-shan to the Chol-tagh range. Its exact level cannot, of course, be determined with full certitude so long as no geometrical levelling has been made; but the two years' observations of the barometer show that its level is, beyond doubt, extremely low. It seems to be no less than 150 feet below the level of the ocean at Lukchun, and 330 feet at the little salt lake Bojaite. Its south-eastern part is now a true desert covered with salt clay and gravel, but numerous burial-mounds, all plundered by this time, testify of its former inhabitants and their wealth in gold. Its western part is watered by the water drawn out of the soil by means of the usual *kerizes*. Many ruins are scattered in the neighbourhood: the fort of Assa-shari, another near Turfan, the

sand-buried ruins of Hosh-dyun, the old town Idigot, surrounded by a wall over 30 feet high, and containing many buildings and temples, now in ruins, and so on.

The population, governed by a Chinese functionary who resides at Turfan, is composed of Musulmans of Turkish origin, some Dungans, and some Chinese. They grow millet, winter wheat, some barley, cotton-trees which give excellent cotton, tobacco, melons, and vegetables. Their orchards contain peach, apricot, mulberry, walnut, pear, apple trees, etc., while at Tuyok they grow only vine-trees for currants.

The Hashun Gobi Desert.

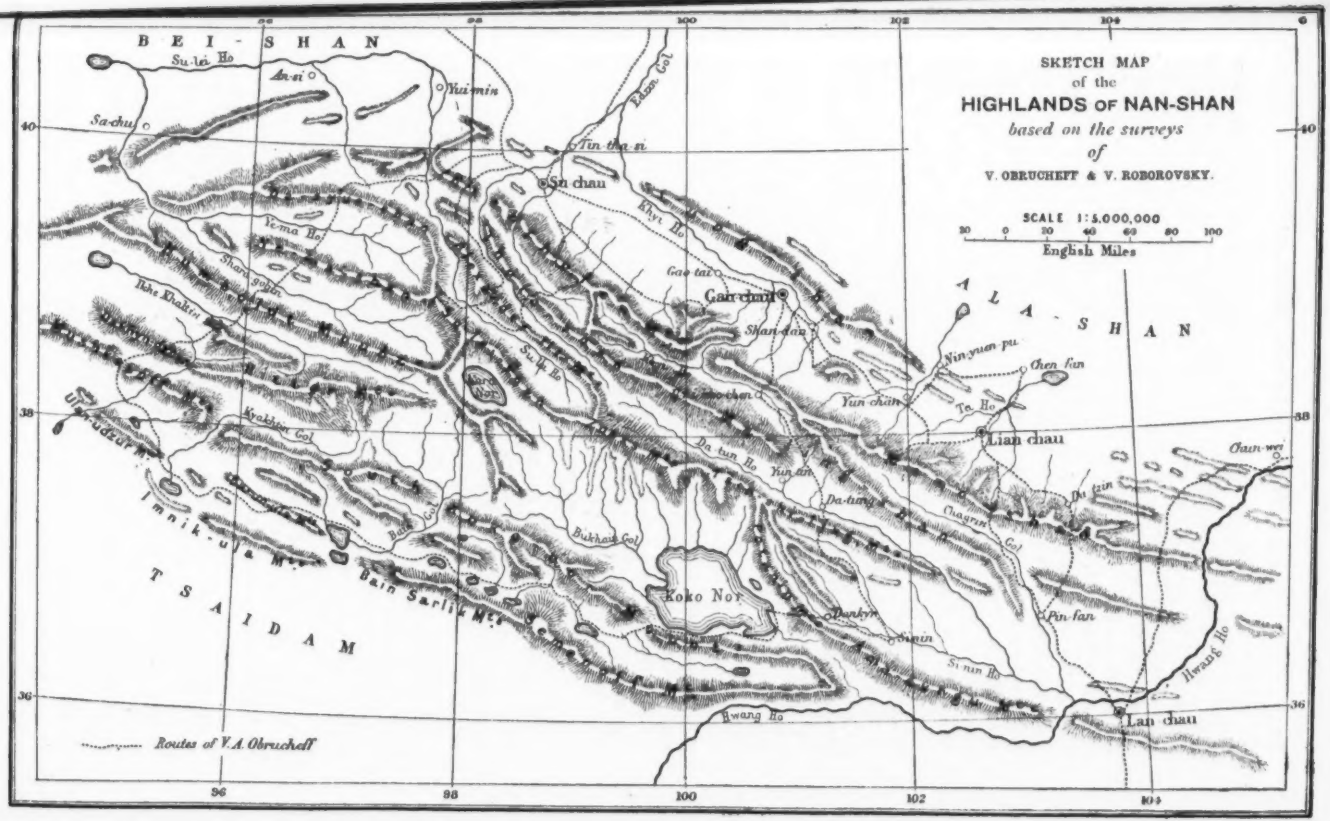
The next spot which it was proposed to reach being Sa-chu (at the northern slope of the Nan-shan), the expedition had now to cross the Hashun Gobi desert, which stretches west to east, and occupies the 250-mile-wide space between the Eastern Tian-shan and the Ala-tagh border range of the high plateaus of Northern Tibet and Tsaidam. The desert has been crossed twice by Prjevalsky on two different routes, and later by General Pevtsoff, and the expedition, dividing into two detachments, went by both routes. Kozloff, with two Cossacks only, went along the Konche-daria, a left-bank tributary of the Tarim, to Lake Lob-nor; and Roborovsky took the eastern route, *i.e.* from Turfan to Hami, and then due south to Sa-chu. Kozloff's journey was especially interesting. He crossed in the meridian of Turfan, the formerly unknown desert range Kuruk-tagh, whence he made an excursion into the depths of the desert, finding there an old route which used to lead from the ancient tower Empen to Sa-chu; he visited also the old bed, Kum-daria, formerly watered by the Konche-daria. He explored next the lowest parts of this last river, and from Lob-nor went eastwards, following a route to Sa-chu which lies to the north of the mountain route followed by Mr. Littledale in 1893.

Roborovsky took the eastern route. He explored first a continuation of the Lukchun depression—also 300 feet below the level of the ocean—and, before reaching Hami, he turned southwards and reached Sa-chu, following with the bulk of the caravan the route of Prjevalsky in 1879. The two explorers thus obtained a full idea of the desert. It represents in its northern portion a plateau, about 100 miles wide, running west to east, and having in its middle a longitudinal valley about 4500 feet above the sea-level. It has in the north a row of low parallel ridges of hills, known as Chol-tagh ("waterless or desert mountains"), and in the south another row of hills, rising to about 6000 feet above the sea, and known on the Lob-nor as Kuruk-tagh ("dry mountains"). As to the Chinese names, Nañ syang, or Bei syang, *i.e.* southern or northern mountains, they are changeable according to whether the mountains are spoken of by people staying to the north or the south of them.

During this part of the journey, both Kozloff and Roborovsky succeeded at last in finding wild camels, and in securing specimens for their collections. A herd of these animals was met with by Kozloff on his way from Lob-nor to Sa-chu, and six of them went to enrich his collections. The winter journey, in December and January, was, of course, very hard. The frosts were severe, and still more so the snowstorms. Thirteen degrees below zero Fahrenheit were an habitual temperature at night in the travellers' tents.

Excursions from Sa-chu.

Roborovsky did not remain inactive during the winter which the expedition passed at Sa-chu. He went south-westwards to explore the Altin-tagh, and followed its northern foot for 175 miles. The great chain is, of course, fringed by a loess terrace, very fertile in a zone of from 7000 to 9000 feet of absolute altitude.


SKETCH MAP
of the
HIGHLANDS OF NAN-SHAN
based on the surveys
of
V. OBRUCHEFF & V. ROBOROVSKY.
SCALE 1:5,000,000
English Miles
BEI-SHAN
NAN-SHAN
TSAIDAM
Su-lei Ho
An-si
Yui-min
Sa-chu
Tin-tha-si
Su chau
Khyi Ho
Yema Ho
Gan chau
Shan-dan
Ning-yuen pu
Chen fan
Yun chan
Te Ho
Lian chau
Chun-wei
Da tun Ho
Yun tin
Da-tung
Du fan
Chagrin Gol
Bukhain Gol
Koko Nor
Pin fan
Hwang Ho
Lan chau
Routes of V.A. Obruchef

Countless *argalis* and *khulans* (wild donkeys) were seen; so also traces of the wild yak. The weather was terrible. When Roborovsky crossed the border range (Altin-tagh) on a pass having an altitude of about 12,000 feet, and reached the Lake Khuntei-nor (which lies on the just-mentioned route from Gas to Sa-chu, followed by Littledale), he was overtaken by snowstorms such as he had never before experienced. At midday it was as dark as after sunset, the whole air being coloured in brown red. One felt as if he were in a photographer's dark room. The force of the wind and the noise made by it can be compared with nothing—they were terrific. Horses could not stand upright; the camels lay down. The tent was torn to pieces; fire and dinner were blown away in a moment; and the fine gravel and sand, blown by the wind, caused unbearable pain as they struck the face and neck. The frost was −12° Fahr.; the animals were emaciated. Three days in succession the party were thus kept without any means to move on. They went at last eastwards, along the route, past the lakes Khuitun-nor, Sukhain-nor (Ikhe-sirtin-nor), and Bulungin (Baga-sirtin-nor)—all three marked incorrectly on Pevtsoff's map. Great numbers of wild camels, *khulans*, and antelopes were seen around these three lakes. At Bulungin-nor Roborovsky turned north, crossed the border range at the Tangin-kutul pass (12,000 feet), and on April 12 returned to Sa-chu.

Three days later Kozloff started eastwards, *i.e.* from Sa-chu to the Chinese town Yui-ming-hsien, on the Sulei-ho river, and 200 miles up this river till its issue from the mountains.

The outer foot of the border range and of the Nan-shan system were thus explored and mapped during the winter on a length of 430 miles. May came, and with it the spring. Myriads of birds were flying northwards; the mountains tempted the travellers, and as soon as there was some grass in the mountain valleys they left Sa-chu, leaving there their collections, and carrying provisions with them on thirty camels.

The Nan-Shan Highlands.

The expedition spent the summer in these mountains, and, travelling as they did in a very thinly peopled region, they sent off no letters so long as they had not reached, in November, 1894, their *depôt* at Kurlik, on the southern side of the Nan-shan (about 125 miles west of Lake Koko-nor).

In order to realize what has been done by the expedition of Roborovsky and Kozloff for the knowledge of the Nan-shan highlands, one ought to compare the map of Prjevalsky with the two sketch-maps given in the Russian *Izvestia* (1895, vol. xxxi. fascicule iii.), upon which the same highlands are covered with a close network of routes of the Russian explorers. Prjevalsky had only touched the western extremity of the highlands as he went from Sa-chu to Kurlik, and two big chains running north-west to south-east are all that appeared on his map. We now know that the Nan-shan highlands, which cover 4 degrees of latitude and 10 degrees of longitude, consist of a series of five to six parallel chains rising above the limits of perpetual snow, with a corresponding number of longitudinal valleys—Lake Koko-nor and its tributary (Bukhain-gol) occupying one of the broadest valleys of the highlands in their southern portion. And when the surveys of the Roborovsky's and Obrucheff's expeditions are embodied in a map, and the reports of the journey published in full, we shall have a complete geographical and geological picture of this interesting borderland between the high plateaus of Eastern Tibet and the Alashan plateau.

On May 23, when the expedition left the Sa-chu oasis, the wheat was already in ear, the onion orchards and the grass fields (*Medicago sativa*) were in full

bloom, and numbers of butterflies fluttered above the fields. They passed by the "Thousand Caves," *i.e.* spacious halls embellished with colossal statues, now much broken by the Dungans, and soon lost view of the last three poplars of the cultivated region. Moving south, they came to the spot where the Dan-ho river (which flows through the Sa-chu oasis) issues from the mountains. Prjevalsky had stayed at this spot (the well Blagodatnyi, or Welcome) about three weeks in 1879, and it was chosen as a basis for further excursions. M. Ladyghin remained there, while Roborovsky and Kozloff began their "excursions."

The high Humboldt chain rose in the south, running south-east to north-west, with its snow-clad peaks towering in the skies, and Roborovsky went across this range. The pass (Kuku-usunin, 13,000 feet above the sea) was of easy access, and from its top he saw the open flat valley of Sirtin, where the above-mentioned lakes Bulungin and Sukhain lie; the snow-clad peaks and the mighty glaciers of the Ritter chain; and, towards the west, the snows of the Anembar-ula mountains—a continuation of the Altin-tagh, which also runs west-south-west to east-north-east. The Sirtin is evidently the bottom of an old Alpine lake, now almost entirely desiccated. Numerous herds of the wild camel stay there in autumn, winter, and spring.

Crossing this depression, Roborovsky went south-east, along the valley which separates Ritter mountains (or rather its lower continuation, Dakhin-daban) from another lower chain, also parallel to the two main ridges, and named Mushketoff's range by Obrucheff. To the indigenes it is known under different names (Beljinula, Bomin-ula, Tsaidamin-ula, and Kyakhtin-ula), borrowed from the rivers which rise in the Ritter mountains, flow at its foot in a longitudinal valley, and then pierce the southern ridge, flowing south-west to the high plains of Tsaidam. This last range, decreasing in height, is continued to the south-east in the south Koko-nor mountains, which consists of two parallel chains, and reaches Lake Koko-nor.

As to Ritter chain, it grows higher in its middle portion, and for about 95 miles consists of high snow-clad peaks, which send mighty glaciers to the north, and are separated from each other by passes 14,500 feet high.

The next parallel ridge, occupying the middle portion of the Nan-shan highlands, is Humboldt chain, separated from Ritter by the fertile valley of the Ikhekhaltin-gol, which flows west-north-west to the above-mentioned Sirtin plateau and Sa-chu. It also rises above the snow-line, but is intersected by several easy passes about 13,000 feet high.

The exploration of the Nan-shan was made in a systematic way. Taking their first station at Kuku-usu in the north, Roborovsky explored the Humboldt, Ritter, and Mushketoff chains and their valleys; while Kozloff explored the north-east portion of the highlands, *i.e.* the high outer ridges Da-syue-shan, and the chain which has received from the Russian Geographical Society the name of Alexander III. mountains, the valley of the Sulei-ho river at the southern foot of this last chain, and another unnamed chain which separates the Sulei-ho river from Lake Kara-nor.

After the two explorers had met at Kuku-usu, they transported their next station 65 miles further south-east, up the Shara-goljin valley, to Ulan-bulak, and thence both went out for further exploration of the middle Nan-shan. Their next station was at Yamatin-umru, at the head of the same valley, whence Roborovsky explored the south-east part of the highlands, reaching Lake Koko-nor, while Kozloff further explored the north-east slope of the highlands.

These two last excursions were made under very great difficulties. As there were no guides, the explorers had to find passes through high snow-clad mountains for themselves. Besides, after August 20 the weather became most inclement.

Snow and rain poured for days in succession, and as both Roborovsky and Kozloff travelled with one or two men only and two camels, they had to make shift with small tents only, and often to sleep under a pouring mixture of rain and snow in the open air. On returning from his second excursion Roborovsky was quite ill; still he undertook a new journey and reached Lake Koko-nor, whence he explored the lakes Sirkhe and Dulan in the west of it. It was only on October 13, 1894, that the expedition took their winter quarters at Kurlik (37° 15′ N., 97° 6′ E. long.), on the banks of the lake of the same name.

The rich zoological, botanical, and geological collections; the surveys covering altogether several thousand miles; the astronomical determinations made during these six "excursions," each of which was a journey which would have made the reputation of an explorer; and, finally, the meteorological observations made at the stations of the expedition, where Ladyghin remained, making rich natural history collections;—all these have made of the formerly unknown Nan-shan highlands a country now much better known than many of the Russian dominions in Turkistan and Siberia. The flora and the fauna of the Nan-shan have much in common with the flora and fauna of Tibet. The fauna is less rich in species than it is in individuals. The wild yak (*Bos gruniens*) is extremely numerous in the high valleys. The wild donkeys (*Equus kiang*, Mongolian *khulan*) are very numerous, and go to the lower valleys as well. The Mongols hunt them for their flesh and hides, which are used for boots. The antelopes are represented by the beautiful tiny *ada* antelope (*Procapra picticauda*), the *khara-sulta* (*Antilope subgutturosa*), and Cuvier's antelope (*A. Cuvieri*), discovered by Prjevalsky. The *argali* is also frequent, as also the *kuku-yaman* (*Ovis nahoor*); while the white-faced *maral* (*Cervus albirostris*), also discovered by Prjevalsky, is too much hunted to be numerous. The meadows are covered with dwellings of the *Lagomys ladacensis*, while the *Lagomys rutilus* is found here and there on the stony slopes. One marmot, *Arctomys Roborovski*, is very frequent on the Alpine meadows of Humboldt mountains. The hares are extremely numerous. Of the carnivores, the first place belongs to the bear, *Ursus lagomyarius*, which feeds on the *Lagomys*, and is as frequent in the Nan-shan as in Tibet. One almost quite white she-bear of this species has been secured for the collections. Wolves abound, and are extremely cunning. One night Roborovsky's encampment had been quite pillaged by them, without the explorers having the slightest suspicion of it. Foxes are relatively rare, while the *korsak* (*Canis Ekloni*) is rather frequently met with. The leopard (*Irbis sp.*) and the lynx are also mentioned by the natives.

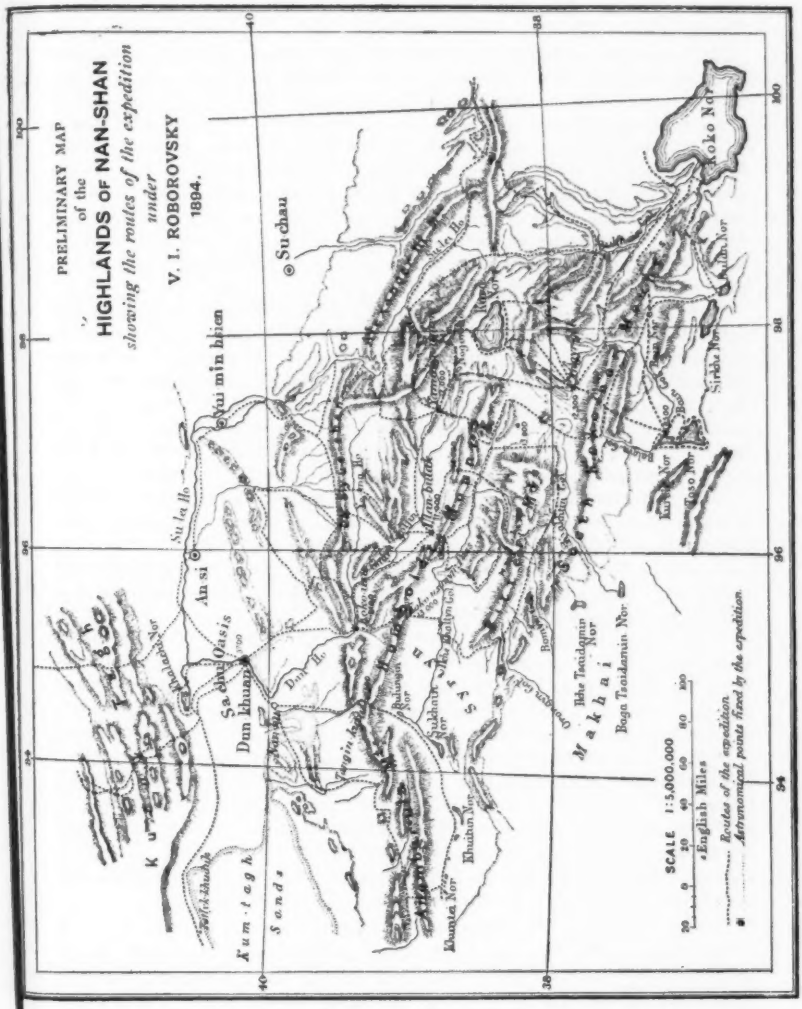
As to man, he is only represented by nomad Mongols in the north, by robber Tanguts in the east, and again by Kurlyk Mongols in the south and west.

From Kurlik to Si-chuan.

After a two months' rest, Roborovsky, not yet recovered from his illness, left Kurlik with Kozloff, Ladyghin, and four soldiers. Yaks had been taken for the transport of luggage and food. Their intention was to penetrate as far as possible south-east, and to reach Si-chuan; but Roborovsky's illness prevented the fulfilment of these intentions. The caravan started on December 13, and they had not covered 100 miles when the yaks began to die from an infectious disease, "khasa," and there was great difficulty in buying new beasts. They followed the Bain-gol, then took to the mountains and reached the north-east end of Lake Toso-nor. Continuing south-east, they followed the banks of the Kara-nor (these two lakes lie between the southern extremities of the third and the fourth journeys of Prjevalsky), whence, crossing the sources of the Churmin river, and following the

foot of the Amne-machin mountains, they came to a river which led to a pass across this ridge. This was on January 21, 1895.

Roborovsky wrote,* "The Amne-machin mountains are entirely snow-clad, and numbers of mighty glaciers creep down their slopes. This is the holy land



of the Tanguts. All gorges, wild and of difficult access, are covered with forests of *Juniperus pseudo sabina* and thickets of willows, and amidst these woods there

* Letter dated "Kurlik, April 8, 1895," in *Izvestia*, 1895, fasciculo 5.

are scattered the many temples of the Tanguts, nearly forty in this locality alone. The lama who governs them stays in a temple amidst the snows of the Amne-machin mountains. The Tanguts are under the orders of chiefs (*Galyks*), who stay on the bend of the Yellow river up to its sources, as also on the lakes Jarin-nor and Orin-nor (Expedition's and Russian on Prjevalsky's maps). These Tanguts are all robbers, and are not subdued to China. They wear no tresses.

"The bend of the Yellow river is situated much further east than it is placed on General Pevtsoff's map. We had covered 335 miles (500 versts) from Kurlik, and we were told by our guide (who absconded at this spot) that there remained ten or twelve days' march more before we could reach the bend of the Hwang-ho. The snowstorms which we experienced at a height of from 13,000 to 14,000 feet, the frosts, and the absence of grass killed our beasts of burden. They perished also from the difficulties of the journey, several of them having fallen down the steep slopes. One mule tumbled down a precipice, and was killed on the spot. I had had a bad pleurisy and erysipelas; nearly all the men coughed fearfully. With all that we perseveringly progressed, in the hope of finally reaching Si-chuan. But this hope was not realized.

"On the night of January 21, when we were going to climb on the Mangun pass across the Amne-machin mountains, I had a stroke of paralysis which attacked all the right part of my body from head to the toes of the right foot; my tongue hardly obeyed my will. I lay in a disgusting and unbearable state for eight days. All this time small groups of Tanguts rode around our camp, and only looked for a propitious moment to attack us. To advance further, with one in such a state, would have been a folly which would have ruined the whole expedition, and, after a hard struggle against myself, I decided to return. On the ninth day after we had turned back (I could already stand upright, move my hands, or hold a rifle), we were attacked by great numbers of Tanguts belonging to two *hoshuns* (two 'flags' or divisions), but the gallantry and pluck of our men repulsed them. They were dispersed by the fire of our Berdan rifles, and suffered a heavy loss in men and horses. We had no casualties; only our tent was shot through in two places by the Tangut bullets.

"We followed the northern shore of Töso-nor and the Bain-gol (or Yograi-gol). Leaving this last, we crossed the Burkhan-buddha mountains, and reached Barunzasak in Tsaidam on April 6. Thence we went to Kurlik. Here we found spring. The marshes inundated their banks, the ice had disappeared from the lakes, masses of aquatic birds had already come; the first plants and insects were frequent.

"My health does not rapidly improve; I cannot move more than one verst (two-thirds of a mile), dragging my right foot. I have difficulty in writing you this letter.

"Our winter journey has added 530 miles more of surveys—we have covered over 660 miles both ways; four points have been determined astronomically. The usual observations were made and collections gathered. Interesting species of birds have been found in the forests of the Eastern Amne-machin mountains."

The Stay at Kurlik.

The next and last letter from Roborovsky, dated "Kurlik, August 10, 1895," gives interesting details of observations on the vegetation and animals at this station, as well as a description of an excursion made in the summer by Roborovsky to the Makhai plain; while Kozloff, in a letter dated from the Nan-shan mountains, gave an account of his journey to explore the region where the Nan-shan highlands meet with the mountains of the Kuen-lun system.

The spring was slow in coming at Kurlik. In April the Mongols began to work in their fields, and masses of people came in for this work. The field is

inundated first for a few days, and when the soil is well soaked, the water is allowed to run away; the seeds are then thrown on its surface in rows, and covered with the soil by the aid of a light plough dragged by a camel, or a horse, or a cow. Large quantities of the corn remain uncovered, and myriads of wild pigeons (*Columba rupestris*) feed upon them. Still, the crops on the loess-like clay are said to be very good.

In April the south Koko-nor mountains were continually covered again and again with snow; the water in the irrigation canals froze every night; and at daytime a strong north-west wind, which carried thick clouds of dust, often prevented the Mongols from working. On the bald dry clay surfaces whirling columns of dust rose, often to the clouds. Although it froze at night, the temperature rose to 77° Fahr. in daytime, and on May 16 it was 112° Fahr. on the surface of the clayey soil. The wind dried everything, and the night frosts destroyed what had grown during the day. The first grass, one inch high, was seen on April 14, and five days later the first leaves of a Composita were noticed, and only on May 19 did Roborovsky find the first flower of the aquatic *Ranunculus* in water warmed in daytime by the sun-rays. In the mountains, vegetation was, however, more advanced on the southern slopes. The first gnats were seen in the first days of May.

The birds were also late to nest—the more so as all old nests are filled during the winter with dust and sand, and the birds have to build new nests each year. The aquatic birds were not very numerous. At night the *Humenius*, *Tringa*, and *Limosa* were heard; also the two species of *Grus nigricolis* and *G. cinereus*, the *Casarca rutila*, the geese (*Anser cinereus* and *A. indicus*), the ducks, (*Anas boschas* and *A. crecca*), and so on. The first swallow (*Cypselus anus*) was seen on May 15. Many *Motacillæ* flew about the encampment, as also wild pigeons and mountain sparrows. The black-fronted lark (*Otocorys sp.*) and the *Fregilus græculus* also visited the cornfields; while in the heights one saw a species of *Gyps* and the eagle *Hypaëtus barbatus*. A kite (*Milvus melanotis*), a crow (*Corvus corax*), and a species of magpie also visited the encampment; while in the bushes the *Podoces Hendersoni*, a species of *Lanius*, and a species of *Saxicola* were heard. In the mountains they saw many *Ullars* (both the *Tetraogallus tibetanus* and a new bigger species of the same genus), the *Turdus Kessleri*, a species of *Carpodacus*, and another of *Parus*. The Tibetan bear (*Ursus lagomyarius*), the *Moschus tangutica*, two species of deer (*Cervus albirostris*, and another not yet described), and the *khara-sulta* antelope (*A. subgutturosa*) were also noticed, and their skins added to the collections.

The whole of Tsaidam, up to the western spurs of the eastern Altyn-tagh, or Anembar-ula, and all the Nan-shan region, are under the rule of the *beise* (prince of fifth degree) of Kurlik. He holds this power from the governor of Si-nin, and his two aids are also invested by the same functionary. All three are the judges in disputes arising among the Mongols, and simply ruin them by their greediness. The continual attacks on behalf of the Tanguts who stay on the Yellow river and about Koko-nor, have induced the *beise* to organize a sort of militia. All able-bodied Mongols under his rule, including the lamas, are bound to keep a horse and to provide themselves with a gun and cartridges. They are brought together in different parts of the country for exercise, and they say that since this militia has been introduced the Tangut raids are not so frequent as they were before.

The trade of the Mongols consists in the sale of various produce of cattle-breeding, the chief centre being Donkir, where they buy from Chinese traders copper, china and wooden vessels, tea, cottons, soldiers' hats, knives, guns, and corn, in exchange for wool, felt, salt, and some sheep and horses. The hunters sell musk, stags' horns, and fox and lynx furs. A few Chinese traders come also to Kurlik. The *beise* also keeps in stock some goods, and sells them to his subjects.

The Kurlik Mongols are not a fine race, as there are among them settlers from different Tangut and Tibet tribes, while the Mongols originate from Khalkha, Tarbagatai, and the Altai region. The settlers coming here are not the best sort of people, and their customs are very loose; there is much drinking going on.

Excursions from Kurlik.

On April 27 Kozloff, with two men and one guide, left Kurlik; they had eight horses. They went south-east, following the south-western foot of the south Koko-nor range up the Bain-gol (tributary of Lake Kurlik), and across a desert region to the Dzukhin-gol, which enters a small lake, Amtsin-nor, 9000 feet above the sea. Up this rather rapid stream they came to a spot, Dolon-turghin, where they saw the first spurs of the Tibet mountains, and entered these spurs, which struck Kozloff by the beauty of their slopes clad in forests of pine trees.

The Karagainin-gol, a stream which rises in the border ranges of the Tibet mountains, flows between high mountains, and, on entering the plain, it joins the Tsagan-usu, being separated by but low spurs from another river, the Tsasa-gol, which flows north-west from the same mountains, and whose upper course is infested by Tangut robbers. The Tamirtin-ula mountains (pass 12,500 feet high) separate the valley of this river from the little lake Sirkhe-nor, which lies at the foot of the south Koko-nor range. A little *khyrma* (fort), Koko-beile, has lately been erected there. The next valley in the mountains, watered by the Dulan-gol, was equally beautiful; and one cannot but be deeply impressed by Kozloff's admiration of the valleys on the slopes of the south Koko-nor ranges, thickly clothed with pine forests, and peopled with a rich fauna of mammals and birds. It was with regret that he left them, and, after having crossed the Sarlik-ula, he turned west, in order to return to Kurlik, where he joined Roborovsky on May 30. The weather, during his thirty-four days' journey, was cold in April, and warm—even hot in the daytime—in May. In April the atmosphere was full of dust raised by the north-west winds. It rained only twice; and only once during a whole day at Kurlik, on June 1.

As soon as Roborovsky felt better, he also undertook a new journey, to explore the Makhai plains. He started on June 13, following the northern shore of Lake Kurlik, whose water is almost sweet, owing to its tributary, the Bain-gol, its temporary affluent, the Balgin-gol, and numerous wells. Some fishes of the *Cobidæ* family were seen in the lake. The lake Toso-nor lies close by, to the south of the former. At the spot where the two near each other, a chain of mountains, the Khabir-ghin-ula, begins, and stretches for over 50 miles north-west, parallel to the foot of the south Koko-nor ridge. Another chain, parallel to the former, runs in the same direction, varying in width and height, and assuming different names; it separates the northern Tsaidam from the southern, and in the meridian of the Makhai joins the Syrtyn-makhain-ula, or Oronghin-ula mountains. Along these two chains Roborovsky went, crossing the former (pass, 12,000 feet) until he came to the salt lake, Baga-tsaidamin-nor, nearly 20 miles in circumference and 10,000 feet above the sea-level, surrounded by meadows—the possession of the Kurlik *beise*.

The Angyrtin-ula mountains were crossed next, and the next lake, Ikhe-tsaidamin-nor, was reached. As its name shows, it is bigger than the former, and is about 35 or 38 miles in circumference; good salt is obtained from it. The Tsaidamin-munku mountains (Mushketoff mountains) raise their snow-clad tops on the north of it, and the Bomin-gol, which originates from the snow of Ritter mountains, pierces it, and, after having pierced another chain (Ichegin-ula), flows to the Makhai plain, to be lost in its gravelly soil. Roborovsky could not, however,

follow this gorge, and preferred to cross the Ichegin-ula chain; and he found that, some 13 miles below its issue from these mountains, the Bomin-ula was lost on the surface of the plain; another river, the Orongin, also flowing from Mushketoff chain, made its appearance, and also was partly lost in the plain, but a new river, Dzun-makhain-gol, flowing in a lake of same name (8500 feet of altitude), took origin from the underground waters. Only some thirty Mongol tents represented all the habitations of the Dzunmakhai plain, which is limited in the north by rocky and desert mountains, and has in the south another smaller plain, Barun-makhai, about 17 miles wide. From the Makhai plain Roborovsky went north, crossed the Sirtin (already visited in the beginning of the summer), and reached the Sa-chu oasis. His last letter hitherto published was dated "Dun-khuan (oasis Sa-chu), August 10, 1895."

Return of the Expedition.

The next news was a telegram, dated "Zaisan, December 3," in which he announced that Kozloff went from Lukchun, *viâ* Guchen, through Dzungaria to Urungu and Zaisan, while himself, with a caravan heavily loaded with collections, journeyed *viâ* Urumchi, Manas, and the waterless Dzungaria, following a new route, also to Zaisan. All were well, after having covered 10,600 miles with surveys, determined astronomically the positions of 30 points, and made during the whole journey meteorological observations. The natural history collections comprised 250 skins and 30 skeletons of mammals, 1200 birds, 450 fishes and reptiles, 30,000 insects, 25,000 specimens of plants (about 1300 species), 300 specimens of seeds, and 350 specimens of rocks. At Lukchun, meteorological observations were made for two years.

Roborovsky and Kozloff are now in St. Petersburg.

THE MONTHLY RECORD.

THE SOCIETY.

Report of the Sixth International Geographical Congress.—The *Report* of this Congress has been published in a single large volume, and distributed to all the members of the Congress who signified their desire to receive a copy. As a certain number of extra copies have been printed, any member who failed to apply previously, and now wishes to obtain a copy, is invited to apply to the Secretaries of the Congress, 1, Savile Row. These applications will be attended to early in October. A copy will also be sent on application to any geographical journal or society which has not yet received one. The volume is sold to the public, price £1, through the booksellers only, the publishers being Mr. John Murray for London, Messrs. Hachette for Paris, and Messrs. Dietrich Reimer (Hoefer und Vohsen) for Berlin.

EUROPE.

Meteorological High-level Station in the Carpathians.—Dr. Karl Pencker, of Vienna, informs us that the plan of the Hungarian Carpathian Club for the establishment of a meteorological observatory on the summit of the Great Schlagendorferspitze, at an elevation of 8066 feet, is about to be carried into effect. The Hungarian Academy and the Hungarian Society of Natural Sciences have promised annual grants, and the Hungarian Meteorological Service, in addition to a grant, will provide the necessary instruments. The cost of the establishment

is estimated at £800. The new station will be the first high-level observatory in the Hohe Tatra or in the Carpathians as a whole, and will be the most easterly mountain station in Europe.

ASIA.

Early Maps of Siam.—In the twenty-seventh volume of the *Annales du Musée Guimet*, which consists of the report by M. Fournereau on the results of his archæological mission in Indo-China in 1891, there is an introductory chapter by M. Gabriel Marcel dealing with maps of Siam from the beginning of the sixteenth century onwards, accompanied by facsimile copies of the same. These maps are interesting, not merely as elucidating the historic geography of Siam, but, since most of them include a large part of the coasts and islands of the far East, as throwing light on the progress of geography generally in these regions. Besides those by well-known cosmographers, several are from maps by less-known or unknown authors, in the collection of the French National Library. We can only allude to some of the earlier maps, which are naturally the most interesting. The first in the collection is Portuguese, and is attributed to Pero Reinel, and to the year 1517. It shows little accurate knowledge of the continental coasts beyond the extremity of the Malay peninsula, although Portuguese ships had already reached China; but as a result of the first voyages to the Moluccas (dating from 1511) the northern shores of the islands east of Java are drawn, although Java is made much smaller than Sumbawa. The planisphere of Diego Ribeiro (1529) shows much improvement, and the shores as far as the south of China are laid down, but are not closed in at the heads of the gulfs of Siam and Tongking. An anonymous map, said to be undoubtedly Portuguese, and apparently dating from the middle of the sixteenth century, shows for the first time (among the maps of this collection) some characteristics which are reproduced in later Dutch maps down to Hondius's 1613 edition of Mercator. The atlas from which this anonymous map is taken is said to possess interesting features in respect of other parts of the world. Among the Dutch maps reproduced are those of Van Langren * (1595), and Evert Gijsbert's son (1599), which are on the whole very similar. Some of the striking points in these maps are: the circular gulf running far into the land near Tenasserim, filled with islands which represent the Mergui Archipelago; the large island encircled by two branches of the Menam at the head of the gulf of Siam; the landward extension of the gulf of Tongking and its pointed shape; and (in most) the extensive shoal of triangular shape lying off the coast of Cochin China. After the date of Hondius, the coasts begin to take a more correct outline, but the common error of making the Menam rise from a very remote source in Tibet still occurs in Robert's map of 1751, although the river's source was more correctly placed by Gueudeville in 1713–1719.

AFRICA.

The Uganda Protectorate.—An official notice, issued by the Foreign Office on June 30 last, intimates that Unyoro and other districts west of that territory and Uganda, and within the British sphere of influence, are placed within the limits of the Uganda Protectorate. The territory administered by the Commissioner, therefore, now extends northwards to the Victoria Nile, and westwards to the shores of Lakes Albert and Albert Edward, and includes the greater part of the Ruwenzori range, together with the lower part of the Semliki valley. It will be remembered

* This map was one of those used for the Dutch editions of Linschoten. See Hakl. Soc.'s edition, I. p. xxxi. It is reproduced on a smaller scale in Pinto's voyages, 'Adventure Series' (1891).

that forts garrisoned by Sudanese troops had already been established in the new territory, both by Captain Lugard and by the officers engaged in the war with Kabarega, but that these were excluded from the Protectorate as originally defined. It is not quite clear from the official notice whether the southern districts (Ankoli, etc.) as far as the German boundary are also included. Eastwards the Protectorate is said to embrace "Usoga and the other territories to the east under the administration of her Majesty's commissioner," which again is somewhat indefinite, as the functions of the commissioner with respect to the territories between the Victoria Nyanza and the coast have never been very clearly defined.

Slatin Pasha in the Sudan.*—Slatin Pasha's account of his sixteen years' sojourn in the Sudan—eleven of them as a prisoner—is of special interest at the present time in connection with the military operations now being carried on in that country, which may be said to have their origin to some extent in his return to civilization. Although the book is necessarily not in any large degree connected with geography, the detailed information as to the state of affairs in the Sudan which Slatin's unique position enables him to give, is of the utmost importance for the study of the political relations of the countries with which it deals. The whole history of the Mahdi's revolt is clearly set forth in its pages, and we are now able to follow the events connected with the siege and fall of Khartum, as watched by an observer at the rebel head-quarters. The cruel and tyrannical character of the "Khalifa" and the deplorable results of his rule, in turning thriving districts into desolate wastes, are graphically drawn. The condition of the subject population is such that, in Slatin's opinion, the hold of the Mahdists over their present domain would at once be loosened in the event of help being brought them from outside. The importance of the fertile Bahr-el-Ghazal province is many times referred to, and the strategical value of its possession insisted on. The thrilling story of Slatin's flight, though already well known in its main outlines, will be read in its detailed form with no diminution of interest. Two maps are given, one showing the environs of Khartum and Omdurman on a large scale; the other embracing the whole Eastern Sudan, and showing the extent of Mahdist influence in 1895.

Expeditions in German East Africa.—Dr. Max Scholler, already known for his journey in Northern Abyssinia, has undertaken an expedition to the region between Kilimanjaro and the Victoria Nyanza, in which he intends, as far as possible, to avoid the routes of previous travellers. Lieut. Werther has also started on a geological expedition to the northern parts of the German territory (*Petermann's Mitteilungen*, 1896, No. 5). In March last an examination of the lower Rufiji as far as the Pangani falls was made by Lieut. V. Grawert, who reports (*Deutsches Kolonialblatt*, 1896, p. 287) that he found everywhere a depth of 6 feet, and generally more. Although the river was then above its mean height, he considers that even in the dry season light craft could ascend to the falls. If a steamer is placed on the river, he thinks it will be necessary to use coal or petroleum as fuel, owing to the general absence of wood from the immediate banks. The southern bank was found to be uninhabited for some distance, owing to a raid of the Mafiti. The Magwangwara have also been giving trouble of late on the caravan-route from Lindi to Lake Nyasa, lately followed by the chief of the station of Langenburg on his way to his post, and it is proposed to found a station to keep them in check (*Kolonialblatt*, p. 314). Early in the present year a short

* 'Fire and Sword in the Sudan.' By Rudolf C. Slatin Pasha, C.B. Translated by Major F. R. Wingate, C.B., D.S.O., R.A. Illustrated by R. Talbot Kelly, R.B.A. London: Arnold, 1896.

expedition was carried out by Captain Johannes from Moshi across the Masai steppe to Umbugwe, near Lake Manyara, for the purpose of coming to terms with the Masai chief Cendeo, who had shown a disposition to move with all his herds into British territory. Although it was the dry season, water was found throughout, though sometimes with difficulty. Both Great Amsha, by which the route led, and Umbugwe are much recommended for cattle-rearing, the former having the advantage in point of climate, for Umbugwe is completely flooded in the rainy season (Ibid., p. 286). Preliminary studies and surveys in connection with the proposed railway from Dar-es-Salaam to Lake Tanganyika are being actively prosecuted, and it is said that the project has been virtually decided on, though a government guarantee of interest has not yet been obtained. According to the *National Zeitung* (quoted by the *Times*), Herr Rindemann has carried the survey as far as Tabora. It is apparently intended that there shall be a branch from that place to the Victoria Nyanza.

Geological History of the Congo Basin.—The probable course of events connected with the draining of the inland sea, which must once have occupied a large part of the central Congo basin, is traced by M. Jules Cornet in the *Bulletin de la Société Belge de Géologie* (vol. x. pp. 64 *et seq.*), in an article dealing with the superficial deposits and the results of erosion in that basin. As M. Wauters points out in the *Mouvement Géographique*, M. Cornet's conclusions agree well with those published by himself in that journal two years ago. The sedimentary deposits formed at the bottom of the ancient sea are represented, M. Cornet points out, by the important strata of soft sandstones found on the upper Congo. As the passage by which the waters found their way to the Atlantic Ocean became deepened, the sea shrank in area, and the streams which flowed down from the highlands on all sides cut deep channels through the sandstones laid bare round the margin, even removing them entirely from certain areas. The continued denudation, both of the older and newer formations, led to the deposit of the sands or sandy clays, often accompanied by rolled pebbles, which are generally found covering the soft sandstones; while the alluvial deposits which border the central Congo and lower Kassai are those formed during the final stage of the existence of the inland sea, of which Lakes Mantumba and Leopold II., together with the broad expansion of the Congo itself, are the last vestiges. The valleys of particular tributaries of the main stream have been subject to a similar process. The Kassai and Ubangi must have once flowed through vast lacustrine basins, which have been drained by the wearing away of their rocky barriers, still marked by rapids in the course of the rivers. On the upper Congo the process has not advanced so far, and some of the lakes still remain at the present day.

Trade of the Congo State.—The *Mouvement Géographique* quotes from the report of the Committee of the Belgian Senate figures which show the growth of the total trade of the Congo State during the last few years, as well as of the share taken by Belgium. While the exports have risen in the seven years ending with 1895, from 2,600,000 to 10,900,000 francs, the share of Belgium has risen from 9½ to 82 per cent. of the whole. Data are not available for the same length of time as regards the imports, which in 1895 were nearly exactly equal to the exports, having considerably exceeded them during the two preceding years. Only 57 per cent. of these are as yet supplied by Belgium. A considerable area has already been planted with coffee on the upper Congo, the yield being calculated at 300 tons, and it is expected that the area will be largely increased within the next few years.

The French in the Western Sudan.—Useful information respecting the French operations in the Western Sudan, including some details of geographical importance, and accompanied by maps, are published from time to time in the

Bulletin du Comité de l'Afrique Française, or in its supplement, which bears the title *Renseignements Coloniaux*. Besides the various expeditions in the region of the lower Niger, which have already been fully noticed in the *Journal*, the following are some of the principal reports which have been published during the past year. A summary (with map) of the mission of Captain Marchand * in the interior of the Ivory Coast, for the purpose of finding the best route to the Niger, appeared in the number for October, 1895 (p. 290). Captain Marchand is strongly in favour of the river Bandama—which debouches near Grand Lahu, and has a basin larger than that of the Comoé—as the natural outlet for the interior of the French Ivory Coast. He bases this opinion on the fact that the central plateau here sends a triangular projection southwards into the forest belt of the coast, with its apex at the point of junction of the two main arms of the Bandama, little more than 40 miles from the coast. On this point, therefore, the routes from the interior naturally converge. The report of Colonel Achinard, well known as the conqueror of Ahmadu, king of Segu, is given in the first number of the Supplement for 1896, and, though dealing primarily with the military operations of the campaign of 1892–93, it contains much information on the country passed through, and its political relations. A map is given, on which both Colonel Achinard's route and that of Colonel Joffre, on his successful expedition against Timbuktu, are laid down. Colonel Joffre's own report, with notes on the geography of the region of Timbuktu and a plan of the city, is given in the second number of the Supplement (p. 44). The same number also contains the report of the operations by Colonel Combes against Samory, which can be followed in a map of the French Sudan given in the *Bulletin* for August, 1895. After the departure of Colonel Achinard, the work of establishing the French authority in the region south of the upper Niger fell to Commandant Destenave, who, from his headquarters at Bandiagara, is said to have pushed southwards as far as Mossi (*Bulletin*, February, 1896, p. 41), and obtained for France a footing in that country. From Dahomé, also, French agents have made their way to the Mossi, and the same *Bulletin* contains a map of the route of M. Alby, from Carnotville to the vicinity of Wagadugu. In this journey, M. Alby several times crossed a stream known as the Gulbi-Kuma, which seems to be the head-stream of the White Volta. A full account of the journey of Lieut. Baud from Dahomé to the Ivory Coast seems not to have been published. Finally, it may be useful to note that all the French West African possessions, exclusive of Dahomé (*i.e.* the Senegal, French Sudan, French Guinea, and the Ivory Coast), have been placed under a governor-general, who controls the general political and military affairs of the colonies as a whole, and also governs that of the Senegal directly. The other colonies are under governors of their own, and retain their administrative and financial autonomy (Supplement, No. 3, 1895).

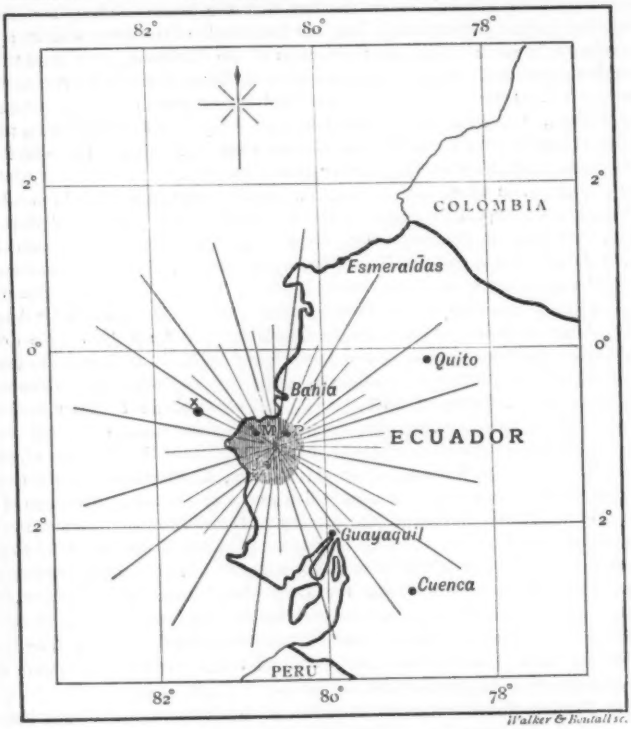
The French Somali Coast.—This is now the official name of the French territory on the Gulf of Aden, including the districts of Obok, Tajura, and Danakil-land. The head-quarters of the administration have been removed from Obok to the newly established port of Jibuti (*Mouvement Géographique*, 1895, No. 24).

AMERICA.

Recent Earthquake in Ecuador.—Mr. C. H. Dolby-Tyler, of Guayaquil, Ecuador, sends the following account of an earthquake which recently occurred there: At precisely 8.45 a.m., on May 3, 1896, the first and severest of a series of earthquake shocks was experienced at Guayaquil. The mean duration of the first attack was 48 to 50 sec., and, in the absence of a seismograph, I estimate it to

* Captain Marchand has been recently commissioned by the French Government to command an expedition to the upper Ubangi.

have been composed of three principal and a number of smaller waves. At 9.2 a.m., we experienced the second movement, which consisted of a single strong wave that lasted 7 sec. The third series was less formidable than the preceding two, lasted over 1 min. 15 sec., and comprised four long and gradually diminishing swells. Since that date scarcely a single night has passed without some slight tremor. The direction of the earth-waves has been invariably from north-north-west. From the accompanying sketch you will be able to see the distribution and relative intensity of the shocks over the whole earth-tremor area, which, allowing for radiation, must have embraced at least 55,000 square miles. The province of Manavi was the



M = MONTE CRISTI. P = PORTOVIEJO. J = JIPIJAPA.
× PROBABLE SEAT OF PRIMARY VOLCANIC DISTURBANCE. TOTAL EARTH-TREMOR AREA, 55,000 SQUARE MILES.

principal sufferer, for there the towns of Montecristi, Portoviejo, and Jipijapa were destroyed, and everything in the immediate vicinity suffered to a greater or less extent. This central region embraced an area of about 1200 square miles. Beyond that district, and covering a circumferential area of 4000 square miles, the seismic motions were remarkably strong, but comparatively no damage was done. The limit of the earth-motions to the east appears to have been slightly beyond the 78° W. Greenwich, and they seem to have been confined exclusively to Ecuador. It is worthy of notice that the waves travelled evenly over the whole of the area mentioned in regular circles, and from their direction point to a common centre.

Thus, at Esmeraldas they are reported to have come from the south-west, at Quito their approach was more directly from the west, and at Guayaquil and Cuenca they arrived approximately from the north-north-west. Large landslips have occurred in the "Cerros de Hoja," a small isolated ridge of Tertiary formation, lying parallel with the coast, to the north-west of Portoviejo, and traces of a line of fault are reported near Jipijapa. At Bahia de Caraquez, which lies immediately outside the seat of these disturbances, enormous quantities of fish, in every stage of decay, have been washed ashore, and the sea-water is stated to have acquired an abnormally bitter (?) taste. I suspect the cause of the recent earthquake to have been of a duplex character. Primarily, volcanic; doubtlessly the early movements originated at sea, within 20 miles of the coast, and between 0° 40′ S. lat., and 1 20′ S. lat. Secondly, "tectonic;" complementary to, and caused by, the impetus derived from the submarine volcanic agency to which I refer. The relative immunity we have enjoyed from earthquakes during the past three years, in a region where changes in the Earth's crust, due to denudation and other influences, are being rapidly evolved, would point to evenly balanced conditions of superior masses, which needed but the slightest volcanic propulsion to cause their disruption, and thus give rise to the formidable movements we have just experienced.

The Canadian Government and Admiral Markham.—The paper on "Hudson's Bay and Hudson's Strait as a Navigable Channel," by Admiral Markham, which was read at the evening meeting on June 11, 1888, was the subject of a Report by the Committee of the Privy Council of Canada on May 15 last. The Prime Minister recommended that, as the paper in question was highly important and of great value, the thanks of the Government of Canada should be conveyed to Admiral Markham, and that his services should be brought to the notice of the Imperial Government. This was done by the Earl of Aberdeen in a despatch to the Secretary of State for the Colonies, dated May 21, 1896, a copy of which was communicated to the Admiralty.

Local Maps in Rhode Island Schools.—In the June number of the *Journal* (vol. vii. p. 665), notice is taken of a paper by Professor W. M. Davis on the state maps of Connecticut as an aid to the study of geography in schools. We have now to notice a similar paper by the same author on the state map of Rhode island. The map, in twelve sheets, on the approximate scale of 1 inch to the mile, has been supplied to all the public schools and libraries in the state, and the little handbook of sixteen pages is intended to guide teachers in the use of this new aid to practical geographical work. There are, as in the former case, hints as to the methods of teaching geography to school-children in the field and from the map, and also an account of the various geographical forms represented on the sheet, with instances of each type named. The relation of surface features to occupation by man is touched on, and general suggestions given for considering the map in that light.

POLAR REGIONS.

Lieut. Peary's Expedition.—Mr. Peary has sent us a newspaper cutting from the pen of Mr. Cyrus C. Adams, in which the main outlines of the programme of his new expedition are sketched. In addition to ethnological studies and scientific collections, the proposed work will include a survey of the coast, especially north of Cape Alexander. South of that cape as far as Cape York, Mr. Peary's former surveys have supplied material for the correction of the charts. The attempt to secure the large meteorite on the north shore of Melville bay is merely an incident in the enterprise, and may or may not be carried out. Mr. Albert Operti, an artist who accompanies the explorer, hopes to take casts of the Cape York natives for the purpose of making models of them. It is not proposed

to proceed north of Cape Sabine, but on the return route an attempt will be made to push into Jones's sound—explored by Inglefield in 1852, but still little known—and Cumberland sound and Hudson strait may also be visited. Two parties of scientific men, headed by Prof. Tarr and Prof. Burton, are availing themselves of the opportunity to proceed north in Mr. Peary's steamer for geological and glacial researches, their destinations being respectively Melville bay and the Great Umanak fiord in South-West Greenland.

Name for North Greenland.—In recognition of the value of Mr. Peary's Arctic work, it has been proposed by the Geographical Club of Philadelphia to name the northern portions of Greenland, which he has done so much to explore, "Peary Land." The tract so named would lie between Independence bay and the 80th parallel.

Mr. Andrée's Balloon Expedition.—According to the Central News, Mr. Andrée was to begin filling his balloon in Dane's Island on July 22, and should the meteorological conditions be favourable, he was to start on July 27.

Sir Martin Conway's Spitzbergen Expedition.—News of Sir M. Conway's expedition has lately been published by the *Daily Chronicle*, giving details down to July 3. On June 23 the expedition left Advent bay, and, after many difficulties from thick snow-beds and deep bogs, crossed the watershed by Fox pass to Myen's bay, sleeping in the open air with a freezing wind and heavy rain. Fox peak was also climbed. After returning to Advent bay by another pass, the travellers ascended through deep bogs to Brent pass, descending to Sassen bay with sledges broken and ponies worn out. It was proposed, when new sledges had been procured, to cross the island to the east coast. A survey of the route, as well as geological investigations, had been carried out.

The Belgian Antarctic Expedition.—The sum of £4000 has been set apart by the Belgian government towards the expenses of the proposed Antarctic expedition, which, according to present plans, will start in September next, under the command of Lieut. Gerlache of the Belgian Marine. The steam whaler *Belgica* has been procured from Norway for the purpose. The region of Graham's land is to be first explored, after which the winter is to be passed in an Australian port. During the following summer Victoria land will be visited, and an endeavour made to ascertain the position of the southern magnetic pole. The expedition will attempt to advance as far south as possible, but its principal object will be to collect information relative to the meteorology, fauna, and flora, etc., of the Antarctic regions. The opening up of the southern whaling industry, and the supply of a stimulus towards the creation of a Belgian commercial marine, are mentioned as some of the general aims of the undertaking.

MATHEMATICAL AND PHYSICAL GEOGRAPHY.

Researches of the "Pola" in the Red Sea.—We have received the following abstract of results of the Austro-Hungarian scientific expedition to the Red Sea, which sailed from Pola on October 6, 1895, and returned on May 18, 1896. The region explored was restricted to the northern part of the Red Sea and the gulfs of Suez and Akaba. Five lines of cross-soundings were traversed, and on these 1243 temperature observations were made, 691 water samples collected, 98 observations of transparency, and 254 estimations of colour of water recorded, and dredgings were made 96 times. Seventy-nine days were spent in the Red Sea itself, sixteen in the Gulf of Suez, and thirty in the hitherto unexplored Gulf of Akaba. Numerous soundings have brought out the general features of the relief of the sea-bottom between Jedda and Suez and Akaba. The Gulf of Suez is shallow, and slopes regularly down to the northern extremity of the Red Sea basin, which has a maximum depth of 640 fathoms, and then over a shoal to 60 fathoms

goes down to 1200 fathoms in 22° 7′ N. lat., 38° E. long. The Gulf of Akaba is separated from the Red Sea by a submarine bank only 70 fathoms from the surface, and in 28° 39′ N. lat., 34° 43′ E. long., attains the comparatively great depth of 700 fathoms. Its coasts are steep, and there are immense coral reefs, both on the east and west sides, which account for the difficulty in entering the gulf. Daily variations of temperature are observable to the depth of over 50 fathoms; a constant temperature of 70·7° Fahr. is recorded below 383 fathoms in the Red Sea and 273 fathoms on the Gulf of Akaba. Salinity increases with depth towards north and west; the water is less transparent than in the eastern Mediterranean, and is not of the same beautiful blue colour.

The Geological Aspects of Geography.—Two recent books, designed for popular instruction in practical geology, bear so closely on the detailed geographical descriptions of regions near home that they may well be noticed together. Mr. Grenville A. J. Cole, in his 'Open-air Studies: an Introduction to Geology Out-of-doors,' utilizes a series of imaginary journeys, over districts which he knows well, in order to bring various kinds of geological structure and succession before his readers, and to serve as a stimulus and guide to their own observations. Introduced by a short chapter on the materials of the Earth, there follow nine descriptive essays involving all the main questions in geology, and in most cases bearing directly on geomorphology or the origin of geographical forms. These are entitled respectively, A mountain hollow; Down the valley; Along the shore; Across the plains; Dead volcanoes; A granite highland; The annals of the Earth; The Surrey hills; and The folds of the mountains. In all these the style is simple and vivid, the language free from technicality, and the reasoning clear and logical. The second book, although also the work of a geologist, is more distinctly geographical in form, being a second edition of Mr. H. M. Cadell's 'Geology and Scenery of Sutherland.' Provided with an orographical and a geological map of the district under consideration, it presents to the reader a remarkably clear account of perhaps the most tangled geological structures in the British Islands, and makes plain the problem which Sir Roderick Murchison misread so seriously. The influence of the different classes of rocks on the scenery, soil, and vegetation of Sutherland is shown with innumerable instances, and the bearing of the various questions on theoretical geology is fully pointed out. The region is remarkably interesting, on account of the ancient sedimentary and metamorphic rocks of the west folded and sheared along the huge thrust-planes, the discovery of which revealed a new instrument to the armoury of Earth-forming agencies, and equally on account of the secondary coal deposits of Brora and the goldfields of Kildonan. The contrast between the Sutherland and the Australian placer mines is centred in the fact that the alluvial deposits of the north of Britain have been so disturbed by the passage of the ice-sheet, that the segregation of gold-dust has been arrested, or the greater part of it swept into the sea, leaving the scattered grains too widely scattered to repay extraction.

The Gulf Stream and the Gulf of Mexico.—In *Petermann's Mitteilungen*, Bd. 42, No. 2, Herr A. Lindenkohl gives a forecast of what promises to be one of the most important contributions recently made to oceanography—a discussion of the numerous observations made in the waters of the Gulf of Mexico and the Gulf Stream by American surveying vessels during the last twenty years. The full memoir is to appear in the 'Annual Report of the United States Coast and Geodetic Survey for 1895,' and, to judge from the abstract under notice, we may expect it to be a model of sound and laborious investigation. Amongst the most important results may be mentioned the conclusion that, so far as it is possible to estimate, the water added to the Gulf of Mexico by rainfall, discharge of

rivers, etc., is about equal in amount to that removed by evaporation. The problem of circulation is thus narrowed down to keeping an account between the waters entering from the Atlantic by the Yucatan channel, and those issuing outwards by the Florida channel, and the balance is so far on the credit side that we are driven to assume the existence of an under reaction-current flowing outwards through the Yucatan channel, like that observed in the Strait of Gibraltar. The Gulf Stream proper is, in fact, but a narrow current of little velocity. It appears, further, from this, as well as from a discussion of the distribution of heat, that the "Gulf Stream," familiarly so called, really owes comparatively little to the Gulf of Mexico, the gulf being certainly quite unable to supply sufficient heat to affect the climate of Western Europe. In accounting for the occurrence of the immense warm drifts off the east coast of North America, vertical circulation is prominently brought forward, and its activity is ascribed to the mixture of waters of different temperatures and salinities somewhat after the manner suggested by the observations of Mr. Dickson on H.M.S. *Jackal* in the North Sea; but considerable stress is laid on the fact that the same change of temperature does not always produce a change of specific gravity corresponding to that produced by an equal amount of salt—the change depending on the actual temperature. It seems difficult to imagine that a secondary influence of this kind can have much scope near the surface directly along a great cyclone track, and we may accordingly look forward to the complete memoir as being likely, not only to furnish us with many new facts of the greatest importance, but to materially aid in elucidating the true relations between the wind and specific gravity forces acting in the establishment and maintenance of the great ocean currents. An English version of Herr Lindenkohl's paper, originally communicated to the Philosophical Society of Washington, appears in *Science*, N.S., vol. iii. No. 60, p. 271.

GENERAL.

Naturalist Travellers.—Under the somewhat sensational title of 'From North Pole to Equator,' Mrs. J. Arthur Thomson has produced a spirited translation of Brehm's most popular book of travel. It describes with a vividness that is perhaps tinctured with extravagance the scenery and the life of the lands he travelled through, from the edge of the Arctic Ocean in Siberia to the upper waters of the Nile. An interesting preface by Mr. J. Arthur Thomson treats of naturalist travellers in general, and classifies them as if they were the objects of their own proper study. He distinguishes the Romantic type with Orderico de Pordenone and other originals of Sir John de Mandeville as specimens, the type culminating in Marco Polo. Then the Encyclopædist type of the sixteenth and seventeenth centuries, animated by "an omnivorous hunger for knowledge," and not very particular as to the material with which they satiated themselves. This gave place to the General Naturalist type of the eighteenth century, of which Pennant, Pallas, and Humboldt are cited as examples. The Specialist type succeeded and roamed the world in modern days in groups on *Challengers* or singly to solve special problems in particular cases. Out of these Mr. Thomson makes to emerge the fifth and highest type of naturalist traveller, the Biological type, dominated by Darwin, containing Wallace and Bates, and also Brehm. Some critics are inclined to class Brehm with the first or romantic class, for his style gives strong expression to the feelings of a nature which seems almost to have been too sensitive for a scientific explorer roughing it on the Tundra or in the African forest. The naive vividness of description is, however, likely to be attractive, and books like this are wanted to arrest the attention of the young and stimulate the love of adventure, which it would be a national misfortune to check. Disillusion will come soon enough in the field, but to the proper stamp of man

will only prove an added stimulus. Sir John Mandeville, or even his modern incarnation the journalistic tourist, is better than so monstrous a production as a *blasé* wanderer who can find no new thing under the sun. Mr. Thomson gives a short biography of Brehm, and a list, short but choice, of modern and recent books by naturalist travellers, to which the readers of Brehm may turn with the certainty of meeting with no disappointment.

German Colonies.*—In this number Forst-Assessor E. Krüger describes the forests and plantations of the Handei mountains. The plantations at Nguelo and Derema appear to be of considerable size, as there are some 200,000 coffee plants in the former, and 87,000 coffee and 4000 tea plants in the latter, not including those in the seed-beds. A few details as to the cultivation are given by Herr Krüger, who states that the vegetation at Derema consisted, three or four years ago, of a forest of very ancient trees of great size, under which was a dense undergrowth of small wood, from ten to thirty years old. Little streams penetrated the forest and kept the ground moist. When these woods were cut down, the heat of the sun and forest-fires destroyed all this undergrowth. This letting in of air and light dried up the soil, and greatly diminished the streams. The planters had cut a series of parallel trenches, with deep draining ditches at right angles; these assisted in the process of desiccation. Even after a torrent of heavy rain, which caused great damage to the plantations, the soil was perfectly dry one or two days afterwards. The planters urgently require better means of transport; they have made, or are making, a pack-animal track to the coast. Vanilla appears to have been a complete failure, probably owing to the absence of sufficient shade and moisture. H. Krüger describes the mountain forests as being generally destitute of creepers, and especially the rubber vine as being completely absent except in the valleys ("Bachthalers"). He also asserts that it is in these valleys only that we find an accumulation of rich humous soil. In both these assertions he contradicts Dr. Baumann, but it is obvious that the question entirely depends on how much of the ground is occupied by valleys. The timber does not appear to be used even by planters on the spot, who find imported wood cheaper, but this is probably due to the extremely unreliable labour and the absence of roads. Chinese and Japanese appear to be employed on most plantations, but the absence of roads is a much greater obstacle to development. Herr Krüger very fully discusses the question of utilizing the various rivers to carry off the timber, but as, according to his own account, most of the trees are too heavy to float, this does not seem practicable. He suggests the establishment of a forest department, which would cost, on a ten years' average, 120,000 marks annually, and might bring in two to three million marks a year. There is also a criticism of the Universities Mission. Herr Walbroth gives, in the same number, an account of the missions in the whole German protectorate. This is of a very detailed nature, giving the names of workers and extracts from the reports of, for example, the Basel, Liepzig, North German, and Berlin I., II., and III. missions. There are some of these extracts which might be of anthropological interest, but the majority are of a very familiar kind. The locusts have caused great sufferings in the East African protectorates. The industrial side of the German missions is much insisted upon in this paper. *The Kolonial-politik im Reichstage* is of too political a nature to be reviewed here, but this number should be consulted to see the manner in which the Government is spending money.

Palæography and Palæogeography.—M. de Lapparent has called our attention to the fact that he does not propose the introduction of the word *Paléographie* as descriptive of the history of earlier geographical conditions, but the word

* 'Kolionales Jahrbuch, Achter Jahrgang,' Heft. 4. Gustav Meinecke, Berlin, 1895.

Paléogéographie. The footnote in p. 65 of the July number of the *Journal* was suggested by a printer's error on page xii. of the 'Leçons de Géographie Physique,' where the title of Lesson 15 is given as 'Principes de la Paléographie,' instead of Principes de la Paléogéographie,' the form which is used in the text.

OBITUARY.

Gerhard Rohlfs.

By E. G. Ravenstein.

In Gerhard Rohlfs, who died at Rüngsdorf, near Bonn, on June 2, Germany has lost one of the most enterprising and successful of her African explorers, and one who had won distinction long before the days when his native country could boast of colonial enthusiasts or African colonies. Born on April 14, 1832, at Vegesack, near Bremen, the son of a physician, Rohlfs was educated at the gymnasium of Osnabrück, and subsequently studied medicine at the universities of Heidelberg, Würzburg, and Göttingen. Fond of adventure—in 1849–50 he had fought as volunteer in the Schleswig-Holstein war—and doubtful of his prospects at home, he enlisted in 1855 in the Foreign Legion of Algeria, and took part, in the humble capacity of an apothecary's assistant, in the conquest of Great Kabylia. The knowledge of Arabic and of native customs which he thus obtained proved of great service in his subsequent travels in the Sahara.

On July 20, 1862, he started from Tangiers, disguised as a Mohammedan physician. His good fortune led him into the house of the enlightened Sherif of Wezzan, who subsequently proved his steadfast protector, and supplied him with letters to his representatives as far south as Tuat. Having visited Fez and Morocco, Rohlfs followed the coast as far south as Wadi Sus, and then, turning in an easterly direction, he reached Tafilet, which only one European, namely, René Caillié, had visited before him. Near a village of the Boana he was robbed by his guides and left for dead in the desert, but two Marabuts who came that way charitably took charge of the stranger, and he was enabled to reach Géryville and Algeria ('Mein Erster Aufenthalt in Marokka Bremen,' 1873; 'Adventures in Morocco,' London, 1874).

Scarcely recovered from his wounds, he once more, in August, 1863, started for the interior. It was his intention to reach Timbuktu, but owing to the disturbed state of the country, he returned from Abiod Sidi Sheikh to Oran, and embarked for Tangiers. He left that place on March 14, 1864, crossed the Atlas at the head of Wad Ziz, where Caillié had crossed before him, once more reached Tafilet (June 8, 1864), and thence proceeded to Tuat, which had never before been visited by a European. His projected visit to Timbuktu appearing impracticable, he ultimately proceeded through Ghadames to Tripolis, where he arrived on December 29, 1864. The expenses of this most successful expedition were partly covered by grants of £50 each from the Senate of Bremen and the Royal Geographical Society ('Reise durch Marokko,' Bremen, 1868).

After a short visit to Europe, Rohlfs returned to Tripolis. In March, 1865, he left that place with the intention of penetrating the highlands of the Ahaggar. Finding, however, the road closed against him, he turned back from Ghadames, stayed five months at Murzuk, and then crossed the desert to Kuka, in Bornu. He reached the Benue by way of Yakoba, descended that river to its confluence with the Niger, and finally reached Lagos (June 1, 1867) by way of Rabba and the Yoruba country ('Quer durch Afrika,' Leipzig, 1874).

In 1867–8 he accompanied the Abyssinian expedition, and on his return from

Magdala, visited the rock-churches of Lalibala and Sokota ('Abessinien,' Bremen, 1868). After a few months' rest, he returned to Tripolis with the presents intended by the King of Prussia for the Sultan of Bornu. Having intrusted these to Dr. Nachtigal, he travelled through Cyrenaica, Awjila, and Siwa to Alexandria, where he arrived on May 26, 1869 ('Von Tripolis nach Alexandrien,' Bremen, 1871). He then returned home, married, and settled down at Weimar. But this period of inactivity was of short duration, for already in 1873 he accepted the command of an expedition which the Khedive dispatched into the Libyan desert, and during which he was accompanied by Dr. Zittel, the geologist; Dr. Ascherson, the botanist; Dr. Jordan, a surveyor; and others. The scientific results of this expedition were of the highest importance. Siwa was reached in February, 1874, after a thirty-six days' march through a sandy desert ('Expedition zur Erforschung der Libyschen Wüste,' Cassel, 1875–6; 'Drei Monate in der Libyschen Wüste,' Cassel, 1875).

In 1878, the German Government intrusted Dr. Rohlfs and Dr. Stecker with an expedition to Wadai. They left Tripolis on December 18, and, after long delays, succeeded in reaching the oasis of Kufra; but, being attacked by Suya Arabs, on September 12, 1879, they were obliged to retreat in haste to Benghazi, where they arrived on October 25 ('Kufra,' Leipzig, 1881). Dr. Stecker was then charged by the German African Association with explorations in Abyssinia. Dr. Rohlfs accompanied him, but, having handed to the Negus Johannes a letter from the Emperor William, at Debra Tabor, he returned to Europe ('Meine Mission nach Abessinien,' Leipzig, 1883).

In 1885, Prince Bismarck, who had a high opinion of Dr. Rohlfs' abilities, appointed him German Consul at Zanzibar; but this experiment in the employment of untrained diplomatists proved anything but encouraging, and Dr. Rohlfs was recalled after having occupied his post for only a short time. He did not again visit Africa.

Dr. Rohlfs, in the course of his extensive travels, made known to us wide regions in Africa, of which, up to his time, we only knew from the reports of earlier Arab explorers or from native information. He never made any astronomical observations, nor seems his knowledge of natural history to have been very profound; but he furnished excellent accounts of the countries he traversed, and their inhabitants, laid down his routes from compass bearings, and kept a careful record of meteorological observations. He therefore fully deserved the Patron's Medal of the Society, which was awarded him in 1868, "for his extensive and important travels in the interior of Northern Africa."

Count Wilfrid von Wagner.

This young traveller, who set out early in 1895 for the Congo, in the hope of accomplishing some geographical exploration in the upper basin of the river, has, we regret to state, fallen a victim to fever without advancing further than Stanley Pool. Before starting for Africa, Count von Wagner had visited England and received instruction in mapping and photography from the Society's instructors, Mr. Coles and Mr. Thomson. He had also become a Fellow of the Society in 1894. We have received some details respecting his ill-fated expedition from his brother, who writes from the Schloss Verinsberg, in Bavaria. In September, 1895, the Count wrote from Kinshassa, on Stanley Pool, saying that he had then been waiting three months for the arrival of his goods, for the conveyance of which an arrangement had been made with the "Société Anonyme Belge." After another month's delay, rendered doubly trying by the risk of failure involved by it to his expedition, he

fell ill with fever, and, in spite of the care and attention of Drs. Carré and Sims of Leopoldville, died on December 23, 1895. Count von Wagner had studied medicine at the Munich University, afterwards devoting his attention to mathematics, and would, it was hoped, have done useful work in Africa, had his life been spared.

MEETINGS OF THE ROYAL GEOGRAPHICAL SOCIETY, SESSION 1895–1896.

Special General Meeting, June 22, 1896.—Sir Clements Markham, K.C.B., F.R.S., President, in the Chair.

This meeting was summoned to consider certain alterations in the bye-laws proposed by the Council, mainly for the purpose of bringing the bye-laws into conformity with the Charter and with actual practice, and to improve the construction of some of the sections. The alterations as proposed by the Council were substantially adopted by the meeting. An amendment proposed by Admiral Halliday Cave, and approved by the Council, was adopted. It was an addition to Chapter VI. section I., "Anniversary Meetings," and referred to the mode of electing the Council. It is as follows:—

"If the name of any Candidate is found to be simply erased in the majority of the balloting papers, without any name being substituted, as provided in paragraph 4 of this section, such Candidate shall not be elected. The vacancy thus created may either be left open till the next Annual Meeting, or be filled up at an adjourned General Meeting of the Fellows, as the Chairman may think best."

In compliance with what seemed to be the feeling of the meeting, the rule as to the order of business at the Anniversary Meetings was altered as follows:—

"The following shall be the Agenda for the Anniversary General Meeting:

(1) The Presentation of the Gold Medals and other awards of the Society.
(2) The Presidential Address.
(3) An interval for the withdrawal of visitors, prior to which no discussion shall be allowed.
(4) The presentation of the Annual Report of the Council.
(5) The election of the Council and Officers for the ensuing year."

Fifteenth Ordinary Meeting, June 22, 1896.—Sir Clements Markham, K.C.B., F.R.S., President, in the Chair.

Elections.—*William Charles Heaton Armstrong, J.P.; Baron Benlinck; R. W. Crosse; Louis William Dane; Sir Charles Alfred Elliott, K.C.S.I.; George Savile Foljambe, J.P.; Colonel James Hayes Sadler; Charles Alfred Gordon Littingston; Henry Simpson Lunn, M.D.; Angus MacLeod, R.N.; Thomas Edward Maddox; Captain W. P. Pulteney (Scots Guards); Captain Thomas Harrison Topham, R.E., D.S.O.; Robert F. W. Schmidt; Lord Wenlock, G.C.S.I.*

The Paper read was:—

"A Recent Eruption of Ambrym Island, New Hebrides." By Commander H. E. Purey-Cust, R.N.

The President said: As this is the last meeting of the Society before November, I should like to say, and I think you will agree with me, that this has been a very interesting session. We have had papers from most parts of the world, all of them of considerable merit, commencing with Mr. Montefiore's account of the proceedings of the Jackson-Harmsworth Expedition. From Asia we have had

the admirable paper describing Mr. Littledale's journey across the great plateau of Tibet, Prince Henri d'Orleans' account of a journey from China to Assam, and a most interesting paper on the Shan States by Colonel Woodthorpe. In Africa, we have listened to Dr. Donaldson Smith's paper on a journey to Lake Rudolf and back to the coast, and to two excellent papers on Hausaland by the Rev. C. H. Robinson and Mr. Wallace. We have been taken to the tops of many mountains. Besides this most interesting trip conducted by Mr. Cust to the top of Ambrym this evening, Mr. Howarth has led us to the summit of Popocatepetl, and Mr. Fitz Gerald has described the Southern Alps of New Zealand. We have had some interesting papers at our afternoon meetings, and the paper given us by Prof. Milne on the movements of the Earth's crust gave rise to a valuable discussion.

I sincerely trust that next session will be as fortunate as this session has been.

GEOGRAPHICAL LITERATURE OF THE MONTH.

Additions to the Library.

By HUGH ROBERT MILL, D.Sc., *Librarian*, R.G.S.

THE following abbreviations of nouns and the adjectives derived from them are employed to indicate the source of articles from other publications. Geographical names are in each case written in full:—

A. = Academy, Academie, Akademie.
Ann. = Annals, Annales, Annalen.
B. = Bulletin, Bollettino, Boletim.
Com. = Commerce, Commercial.
C. Rd. = Comptes Rendus.
Erdk. = Erdkunde.
G. = Geography, Geographie, Geografia.
Ges. = Gesellschaft.
I. = Institute, Institution.
J. = Journal.
M. = Mitteilungen.
Mag. = Magazine.
P. = Proceedings.
R. = Royal.
Rev. = Review, Revue, Revista.
S. = Society, Société, Selskab.
Sitzb. = Sitzungsbericht.
T. = Transactions.
V. = Verein.
Verh. = Verhandlungen.
W. = Wissenschaft, and compounds.
Z. = Zeitschrift.

On account of the ambiguity of the words *octavo*, *quarto*, etc., the size of books in the list below is denoted by the length and breadth of the cover in inches to the nearest half-inch. The size of the *Journal* is 10 × 6½.

EUROPE.

Austria-Hungary. **Baedeker.**

Austria, including Hungary, Transylvania, Dalmatia, and Bosnia. Handbook for Travellers by Karl Baedeker. With 28 Maps and 25 Plans. Eighth Edition. Leipsic: Karl Baedeker, 1896. Size 6½ × 4½, pp. xiv. and 468. *Price* 7 *marks.* *Presented by Messrs. Dulau & Co.*

Austria—Karst. *Globus* 69 (1896): 302–306. **Moser.**

Einst bewohnte Felshöhlen des Karstes im österreichischen Littorale. Von Prof. Dr. Karl Moser, Triest. *With Illustrations.*

Baltic Pilot.

Baltic Pilot, Part i., formerly published as the Danish Pilot. Originally compiled by the late Vice-Admiral Zahrtmann. Third Edition. London: J. D. Potter, 1895. Size 9½ × 6, pp. xx. and 534, *index chart.* *Price* 5*s.* 6*d.* *Presented by the Hydrographic Office, Admiralty.*

Channel Pilot—Supplement.

Supplement, 1895, relating to Channel Pilot, Part i. Eighth Edition, 1893. Corrected to July, 1895. London: J. D. Potter, 1895. Size 9½ × 6, pp. 70. *Price* 9*d.* *Presented by the Hydrographic Office, Admiralty.*

Eastern Europe. *Ann. G.* 5 (1896): 305–308. **Tillo.**

Carte hypsométrique de la partie occidentale de la Russie d'Europe. Par M. le Lieutenant Général Alexis de Tillo. *With Map.*

A sheet of this beautiful contoured map on the scale of 1: 1,680,000, including

the whole Carpathian range, is reproduced in colours and without names, giving a striking picture of the configuration of the country.

France—Auvergne. *Ann. G.* **5** (1896): 277–296. **Boule.**

La topographie glaciaire en Auvergne. Par M. Marcellin Boule. *With Maps and Illustrations.*

An interesting and excellently illustrated account of the glacial land-forms of Auvergne, including several admirable examples of the type of scenery well known in Scotland as "Crag-and-tail." A map is given showing the probable position and direction of the ancient glaciers of Auvergne.

France—Glaciers. *C. Rd.* **122** (1896): 1153–1155. **Bonaparte.**

Mesures des variations de longueur des glaciers de la région française. Note du prince Roland Bonaparte.

France—The Faucilles. *B. Trim. S.G. de l'Est* (1895): 369–377. **Fournier.**

D'où vient le nom de Faucilles? Par A. Fournier.

France—Normandy. *Rev. Scientifique* (4 S.) **5** (1896): 620–624. **Thoulet.**

Les falaises du pays de Caux. Par M. J. Thoulet.

Germany. *Notizblatt Ver. Erdk. Darmstadt* (4) **16** (1895): 19–32. **Klemm.**

Ueber die Glacialerscheinungen im Odenwald und Spessart. Von G. Klemm. *With Plates.*

Germany—Bavaria. **Gruber.**

Forschungen zur deutschen Landes- und Volkskunde . . . herausgegeben von Dr. A. Kirchhoff. Neunter Band. Heft 6. Der Hesselberg am Frankenjura und seine südlichen Vorhöhen. Von Dr. Christian Gruber. Stuttgart: J. Engelhorn, 1896. Size 9½ × 6½, pp. [80]. *Map, Diagram, and Illustrations.*

An excellent piece of local geography, commencing with the literary associations of the district and the meaning of the name, then taking up the history of the various surveys and maps of the isolated hill-mass known as the Hesselberg, and entering into the geomorphological data of mean height, volume, structure, etc. Special topographical references to different parts of the district are given, two short chapters are devoted to springs, watercourses, and meteorology; and in conclusion there is a chapter on the economic characteristics of the district.

Germany—Colonies. ———

Jahresbericht der Deutschen Kolonialgesellschaft, 1895. Berlin, 1896. Size 9½ × 6½, pp. 78.

Germany—Posen. *Petermanns M.* **42** (1896): 118–120. **Langhans.**

Die bisherige Thätigkeit der Ansiedelungs-Kommission für die Provinzen Westpreussen und Posen. Von Paul Langhans. *With Map.*

Statistics of the work of the Commission for German settlements in Prussian Poland, illustrated by a map on the scale of 1 : 500,000, or about 8 miles to an inch.

Italy—Alps. *Mem. S.G. Italiana* **5** (1896): 384–434. **Stefani.**

Studio idro-geologico sulla sorgente della Pollaccia nelle Alpi Apuane del socio Carlo de Stefani. *With Map.*

Italy—Cagli Earthquake. *Mem. S.G. Italiana* **5** (1896): 363–383. **Baratta.**

Sul terremoto di Cagli del 3 giugno 1781. Studio del Socio Mario Baratta.

Italy—Mont Herbetet. *Alpine J.* **18** (1896): 84–96. **Oliver.**

Mont Herbetet and its Southern Ridge. By F. W. Oliver. *With two Illustrations.*

Mediterranean Pilot. ———

The Mediterranean Pilot. Vol. ii. Comprising Coasts of France, and of Italy to the Adriatic; African Coast from Jerba to El Arish; Coasts of Karamania and Syria, together with the Tuscan Archipelago, and Islands of Corsica and Cyprus. Third Edition. London: J. D. Potter, 1895. Size 9½ × 6, pp. xxvi. and 510. *Index Chart. Price 5s. Presented by the Hydrographic Office, Admiralty.*

Mediterranean—Sicily and Malta. **Erödi.**

Utazásom Sicilia és Malta szigetén. Irta Erödi Béla. Budapest: Lampel Róbert, [1895]. Size 9½ × 6½, pp. 220. *Map and Illustrations. Presented by the Author.*

Montenegro. **Cozens-Hardy.**

The Frontiers of Montenegro. By W. H. Cozens-Hardy, 1894. Size 13½ × 8½. MS.

North-Western Europe. *Quarterly J. Geolog. S.* **52** (1896): 331–406. **Geikie.**

The Tertiary Basalt-plateaux of North-Western Europe. By Sir Archibald Geikie, D.SC., etc. *With Plates and Sections.*

Norway. **Richter.**

Geomorphologische Beobachtungen aus Norwegen. Von Dr. Eduard Richter. Aus den Sitzungsberichten der Kaiserl. Akademie der Wissenschaften in Wien. Mathem.-naturw. Classe; Bd. CV. Abth. I. Februar 1896. Wien, 1896. Size 10 × 6½, pp. 44. *Plates. Presented by the Author.*

Norway. **Bradshaw.**

Norway, its Fjords, Fjelds, and Fosses. By John Bradshaw. London: Digby, Long & Co., [1896]. Size 8 × 5, pp. 218. *Price* 3*s.* 6*d. Presented by the Publishers.*

This book, after three general introductory chapters, is simply a narrative of one of the pleasure cruises along the coast of Southern Norway. There are neither maps nor illustrations.

Norway—Glaciers. *Petermanns M.* **42** (1896): 107–110. **Richter.**

Beobachtungen über Gletscherschwankungen in Norwegen 1895. Von Prof. Dr. E. Richter.

Russia—Ålands Islands. *Deutsche Rundschau G.* **18** (1896): 193–202, 300–310. **Weis.**

Die Ålands-Inseln. Von Anton Weis. *With Map and Illustrations.*

Russia—Novorosseisk. *B.S.G. Commerc. Bordeaux* **19** (1896): 193–198. **Bénard.**

Novorossiisk. Par Charles Bénard. *With Sketch-map.*

Describing the Black Sea harbour of Novorossiisk, and showing the importance of its relation to the corn-lands of South Russia.

Russia—Theodosia. **Soudak.**

A travers le Monde, Tour du Monde (n.s.) **2** (1896): 121–124.

Théodosie Port de Mer. Par M. Louis de Soudak. *With Illustrations.*

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Southern Sweden, 1894. By Edward W. Mellor. *With Map and Illustrations.*

Sweden—Sea-level. *Ymer* **16** (1896): 65–77. **Rosén.**

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The West of Ireland.

Refers mainly to the conditions of life in the extreme west of Ireland.

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Year-Book of the Scientific and Learned Societies of Great Britain and Ireland: Comprising Lists of the Papers read during 1895 before Societies engaged in fourteen departments of Research, with the names of their Authors. Compiled from Official Sources. Thirteenth Annual Issue. London: C. Griffin & Co., 1896. Size 9 × 6, pp. vi. and 262. *Price* 7*s.* 6*d.*

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Report of the Meteorological Council for the Year ending 31st of March, 1895; submitted to the President and Council of the Royal Society. London: Eyre & Spottiswoode, 1895. Size 10 × 6½, pp. 132. *Map. Price* 8½*d. Presented by the Meteorological Office.*

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Catalogue of the Maps and Plans and other publications of the Ordnance Survey of England and Wales, and the Isle of Man, to 1st of January, 1896. Colonel J. Farquharson, C.B., etc., Director-General of the Ordnance Surveys, Southampton. London: E. Stanford, 1896. Size 10½ × 6½, pp. 836. *Index Maps. Price* 1*s.* 6*d. Presented by the Publisher.*

United Kingdom—Population. *Rev. Scientifique* (4 *s.*) **5** (1896): 591–594. ——

Le mouvement de la population dans la Grande-Bretagne de 1881 à 1895.

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Sailing Directions for the West Coast of Scotland: the Mull of Galloway to Cape Wrath, including the Hebrides or Western Islands. Originally compiled from

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Bartholomew's Pocket Guide to Edinburgh and Neighbourhood. Second Edition. With 12 Maps and Plans. Edinburgh: J. Bartholomew & Co., 1896. Size 6½ × 4½, pp. xxii. and 88. *Price* 1*s. Presented by the Publishers.*

A compact and trustworthy guide, admirably equipped with maps, including the reproduction of an interesting map of Edinburgh dated 1647, in the form of a bird's-eye view of the old town.

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Boer and Uitlander. The True History of the Late Events in South Africa. By William Frederick Regan. *With Original Portraits, Map, and Plan.* London: Digby, Long & Co., 1896. Size 8 × 5½, pp. xvi. and 248. *Price* 3*s.* 6*d. Presented by the Publishers.*

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Géographie comparée de la Tunisie. Le texte de Scylax et la région du Triton. Historique du débat qu'il a soulevé. Le manuscrit original de la Bibliothèque nationale. Par le Dr. Rouire. *With Maps.*

West Africa—Ashanti. **Baden-Powell.**

The Downfall of Prempeh. A Diary of Life with the Native Levy in Ashanti, 1895–96. By Major R. S. S. Baden-Powell. With a chapter on the Political and Commercial Position of Ashanti, by Sir George Baden-Powell, K.C.M.G., M.P. London: Methuen & Co., 1896. Size 9 × 6, pp. 200. *Map and Illustrations. Price* 10*s.* 6*d. Presented by the Publishers.*

A spirited and racy narrative of the Ashanti expedition, admirably written and well illustrated.

Western Sudan—Timbuktu. *B.S. Languedocienne G.* **18** (1895): 171–188. **Joffre.**

Région de Tombouctou. Extrait de la relation du Lieutenant Colonel Joffre publiée par la *Revue du Génie militaire* (Janvier–Juin 1895).

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Geographical Notes in Alaska. By Wm. H. Dall, U.S. Geolog. Survey. *With Sketch-Maps.*

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Part M. Annual Report, Vol. vii. Geological Survey of Canada, G. M. Dawson, Director. Report on the Surface Geology of Eastern New Brunswick, North-Western Nova Scotia, and a portion of Prince Edward Island, to accompany ¼-sheet maps, No. 2 S.E., No. 5 S.W., and No. 4 N.W. By Robert Chalmers, Ottawa, 1895. Size 10 × 6½, pp. 150. *Maps (three separate) and Plates.*

Deals largely with the conditions of glaciation, and contains excellent photographs of characteristic ice-action, as well as geological maps.

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History of British Columbia from its Earliest Discovery to the Present Time. By Alexander Begg. Toronto: W. Briggs, 1894. Size 9 × 6, pp. 568. *Map, Portraits, and Illustrations.*

Canada—British Columbia Pilot.

Supplement, 1895, relating to British Columbia Pilot. [First Edition, 1888.] (Corrected to January, 1895.) London: J. D. Potter, 1895. Size 10 × 6, pp. 44. *Price* 1*s*. *Presented by the Hydrographic Office, Admiralty.*

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Department of the Interior. General Report on Irrigation and Canadian Irrigation Surveys, 1894. Ottawa: Government Printing Bureau, 1895. Size 9½ × 6½, pp. vi. and 140. *Maps (separate) and Plates.*

Description of the surveys carried out with a view to establishing a system of artificial irrigation in Alberta and other districts of small rainfall east of the Rocky mountains.

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Part F. Annual Report, Vol. vii. Geological Survey of Canada. G. M. Dawson, C.M.G., etc., Director. Report on the Country in the vicinity of Red Lake and part of the Basin of Berens River, Keewatin. By D. B. Dowling. Ottawa, 1896. Size 10 × 6½, pp. 54. *Map. Presented by the Geological Survey of Canada.*

Canada—St. Lawrence Pilot.

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Note on Secondary Undulations recorded by Self-Registering Tide Gauges; and on Exceptional Tides in Relation to Wind and Barometer. By W. Bell Dawson. From the Transactions of the Royal Society of Canada. Second Series, 1895–96. Volume i., Section iii. Mathematical, Physical and Chemical Sciences. Ottawa: J. Durie & Son, 1895. Size 10 × 6½, pp. [2]. *Plates.*

Mexico—Palenque. **Maudslay.**

Biologia Centrali-Americana; or, Contributions to the Knowledge of the Fauna and Flora of Mexico and Central America. Edited by T. Ducane Godman and Osbert Salvin. Archæology. By A. P. Maudslay. [Part vi., April, 1896.] (Vol. iv., pp. 1–18.) London: R. H. Porter, and Dulau & Co. Size 13 × 10½. *Plates* i.–xxiv. (*separate*), size 13 × 20½.

Mr. Maudslay here describes his researches at Palenque, giving an account of the difficulties he had to overcome with regard to transport, labour, and climate, and concluding with a general description of Palenque. The photographs illustrating the report are accompanied by a large-scale plan of the ruins, a number of sections, and a series of drawings, one of them being a coloured reproduction of a mural design.

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North America—Lakes. **Russell.**

Lakes of North America. A Reading Lesson for Students of Geography and Geology. By Israel C. Russell. Boston, U.S.A., and London: Ginn & Co., 1895. Size 9½ × 6½, pp. xii. and 126. *Maps and Illustrations. Price* 6*s*. 6*d*.

In this little volume Professor Russell uses the lakes of North America as a text for a discourse on the origin of lake basins and the part played by lakes in the changes studied by dynamic geology.

United States—California—Mount King. *Sierra Club B.* 1 (1896): 241-253. **Brown.**

Three days with Mt. King. By Professor Bolton Coit Brown. *With Illustrations.*

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The Bearpaw Mountains of Montana. First Paper. By Walter Harvey Weed and Louis V. Pirsson. *With Sketch-Map, etc.*

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Johns Hopkins University Studies in Historical and Political Science. Fourteenth Series. IV.-V. Slavery and Servitude in the Colony of North Carolina. By John Spencer Bassett, PH.D. Baltimore, 1896. Size 9½ × 6½, pp. 86.

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Argentine—Chile Frontier. **Magnasco.**
La Cuestión de Limites. El alegato Chileno (Refutación). Por Osvaldo Magnasco. Buenos Aires: F. Lajouane, 1896. Size 9 × 6, pp. 56. *Presented by the Author.*

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Brazil—Jesuit Missions. *Rev. I. Hist. e G. Brazileiro* 57 (1) (1894): 213–247. ——
Trabalhos dos primeiros jezuitas no Brazil.

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America Abreviada, suas noticias e de seus naturaes, e em particular do Maranhão, titulos contendo instruções á sua conservaçao e augmento mui uteis, pelo Padre João de Souza Ferreira.

Brazil—Maranhão. *Rev. I. Hist. e G. Brazileiro* 56 (2) (1894): 1–4. **Marques.**
Expedição de Axuhi para o descobrimento de uma requissima cidade no interior da então capitania, hoje provincia do Maranhão. Pelo Dr. Cezar Augusto Marques.

Brazil—Native Indians. *Rev. I. Hist. e G. Brazileiro* 57 (1) (1894): 185–212. ——
Principio e origem dos indios do Brazil e seus costumes, adorações e ceremonias.

Brazil—River Japoc. *B.S.G. Commerc. Paris* 18 (1896): 282–288. **Landes and Caillaud.**
La rivière de Vincent Pinzon ou de Japoc. Par Professor G. Landes.
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Chile—Sailing Directions. **Chaigneau.**
Instrucciones Nauticas de la Costa de Chile. Segunda Parte (De Coquimbo a Arica e islas esporádicas). Por J. Federico Chaigneau. Santiago de Chile, 1895. Size 10 × 7½, pp. 112. *Illustrations.*

Colombia. ——
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Falkland Islands. *Scottish G. Mag.* 12 (1896): 241–252. **Routledge.**
The Falkland Islands. By R. M. Routledge.

French Guiana. *B.S. Languedocienne G.* 18 (1895): 332–363. **Viala.**
Guyane Française et territoire contesté entre la France et le Brésil. Par L. Fernand Viala.

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Memoria de Estadística de la República de Guatemala, 1893. Guatemala, 1895. Size 12 × 9, pp. 664 and 272. *Presented by the Government of Guatemala.*

Paraguay—Caduvei tribe. *Mem. S.G. Italiana* **5** (1896): 237-293. **Boggiani.**

I Caduvei, studio intorno ad una tribù indigena dell' Alto Paraguay nel Matto Grosso (Brasile), del Cav. Guido Boggiani. *With Illustrations.*

South America Pilot.

The South America Pilot. Part ii. Comprising Magellan Strait, Tierra del Fuego and West Coast of South America, from Cape Virgins (S.E. Coast) to Panama Bay, including the Galápagos Islands. Ninth Edition. London: J. D. Potter, 1895. Size 9½ × 6, pp. xxii. and 654. *Index Charts. Price* 7*s.* 6*d. Presented by the Hydrographic Office, Admiralty.*

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Bureau of the American Republics. Washington, U.S.A. Venezuela. Laws regulating Immigration and Public Lands. Special Bulletin. June, 1895. Size 9½ × 6½, pp. 50.

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Cuba und die spanische Kolonisation. Von Ernst Boetticher, Hauptmann a. D.

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The Plains of Australia. By George E. Boxall.

Australia. **Coningsby.**

The Discovery of Gold in Australia. By Robert James Coningsby. London: W. Milligan & Co., 1895. Size 8½ × 5½, pp. 64. *Portrait and Illustrations. Presented by the Author.*

An account of Mr. John Calvert's discovery of gold in Australia, and miscellaneous information as to the occurrence and extraction of gold.

Australia—Horn Scientific Expedition. **Spencer.**

Report on the Work of the Horn Scientific Expedition to Central Australia. Part ii.—Zoology. Edited by Baldwin Spencer, M.A. London: Dulau & Co., 1896. Size 10½ × 8, pp. iv. and 432. *Plates (some coloured). Presented by the Publishers.*

A complete account of the important zoological collections made on the expedition.

Australia—Nautical Directory.

Australia Directory. Vol. iii. North, North-West, and West Coasts, from the Gulf of Carpentaria to Cape Leeuwin. Originally compiled by Captain Charles B. Yule, R.N. Third Edition. London: J. D. Potter, 1895. Size 9½ × 6, pp. xxiv. and 440. *Index Chart. Price* 4*s.* 6*d. Presented by the Hydrographic Office, Admiralty.*

Australia—Year-Book. **Greville.**

The Year-Book of Australia for 1896. Edited by the Hon. Edward Greville. Fifteenth year of publication. London: Paul & Co. Size 9 × 6, pp. 718. *Maps. Price* 10*s.* 6*d. Presented by the Agent-General for New South Wales.*

Melanesia—Matty Island. *J. Anthrop. I.* **25** (1896): 288-295. **Edge-Partington.**

The Ethnography of Matty Island. By J. Edge-Partington. *With Plates.*

New Zealand. *Alpine J.* **18** (1896): 69-84. **Fitz Gerald.**

Three Ascents in New Zealand. By E. A. Fitz Gerald. *With Illustration and Map.*

Queensland—Almanac and Directory. **Pugh.**

Pugh's Almanac and Queensland Directory for 1896. Thirty-eighth year of publication. Brisbane: Gordon & Gotch, 1896. Size 7½ × 5, pp. xxxii., 384, 224A, and 336B. *Map and Plan.*

Queensland—Cave-Drawings. **Jack.**

On Aboriginal Cave-Drawings on the Palmer Goldfield. By Robert L. Jack, Government Geologist. [Read before the Royal Society of Queensland, December 14, 1895.] Size 8½ × 5½, pp. 8. *Plate. Presented by the Author.*

West Australia—Goldfields. **Price.**

The Land of Gold: the Narrative of a Journey through the West Australian Goldfields in the Autumn of 1895. By Julius M. Price. London: Low & Co., 1896.

Size 7½ × 5, pp. xx. and 204. *Portrait, Map, and Illustrations.* ***Price 7s. 6d.*** *Presented by the Publishers.*

A short and popular work based on correspondence and sketches sent home by the Author to the *Illustrated London News*. It gives a vivid impression of the actual condition of things on the goldfields. There are appendices giving some account of mining rights, and a good map of the goldfields.

POLAR REGIONS.

Antarctic Exploration. *J. Tyneside G.S.* **3** (1896): 228–241. **Bruce.**

Antarctic Exploration. By William S. Bruce. *With Illustrations.*

Antarctic Exploration *B.S.R. Belge G.* **20** (1896): 93–122. **Delaite.**

Interêt scientifique de l'expedition antarctique belge. Par Julien Delaite. *With Illustrations.*

Antarctic Exploration. *Nature* **54** (1896): 29–31. **Mill.**

Projects for Antarctic Exploration. By Dr. Hugh Robert Mill.

Greenland. *J. Geology* **3** (1895): 875–902. **Salisbury.**

The Greenland Expedition of 1895. By Rollin D. Salisbury.

Greenland—Northern. **Astrup.**

Eivind Astrup. Blandt Nordpolens Naboer. Med illustrationer af Th. Holmboe . . . samt Fotografier og Karter. Kristiania: H. Aschehoug & Co., 1895. Size 9½ × 6½, pp. 320.

An account of the expedition of Lieutenant Peary in 1894 to North Greenland, by his companion the late Mr. Eivind Astrup. The book is illustrated by excellent photographic reproductions.

Greenland—Northern. *B. American G.S.* **28** (1896): 21–36. **Peary.**

Work in North Greenland in 1894 and 1895. By Civil Engineer R. E. Peary, U.S.N. *With Map.*

A short account and large-scale map of the work done by Mr. Peary in his last expedition.

MATHEMATICAL GEOGRAPHY.

Astronomy—American Ephemeris. ———

The American Ephemeris and Nautical Almanac for the year 1898. Washington: Bureau of Equipment, 1895. Size 11 × 7½, pp. 538. *Plates.*

Catalogue of Charts, etc. ———

Catalogue of Charts, Plans, Sailing Directions, and other publications of the United States Hydrographic Office, January 1, 1896. Washington: Government Printing Office, 1896. Size 11½ × 9½, pp. 110. *Charts. Presented by the U.S. Hydrographic Office.*

Observations of Position. *Petermanns M.* **42** (1896): 111–118. **Harzer.**

Ueber geographische Ortsbestimmungen ohne astronomische Instrumente. Von Prof. Dr. P. Harzer.

On the means of fixing the latitude and longitude of a place without astronomical instruments.

Proposed World Map. *B. Trim. S.G. de l'Est* (1895): 378–383. **Barbier**

Note additionnelle au rapport sur le projet de carte de la Terre à l'échelle de 1:1,000,000 devant la Commission technique de la Société de Géographie de l'Est. Par M. J.-V. Barbier.

Proposed World Map. *B.S.R.G. d'Anvers* **20** (1896): 449–491. **Wauwermans.**

La Carte du Monde au millionième au Congrès de Londres de 1895. Par M. le lieutenant-général Wauwermans.

General Wauvermans enters very fully into Professor Penck's scheme for a map of the world on the scale of 1:1,000,000, and makes certain suggestions with regard to the possibility of its realization.

Sunrise and Sunset Map. *Petermanns M.* **42** (1896): 92–94. **Vogt.**

Karte der winterlichen Sonnenauf- und untergänge in Deutschland für mitteleuropäische Zeit. Mit erläuterndem Text von Prof. Dr. H. Vogt. *With Map.*

Surveying Instrument. *B. Trim. S.G. de l'Est* (1895): 392–394. **Schrader**

Le Tachéographe de F. Schrader. Nouvel instrument servant au tracé et au levé directs du terrain.

Terrestrial Globe. *Contemporary Rev.* (1896): 730–740. **Wallace.**

The Proposed Gigantic Model of the Earth. By Alfred R. Wallace.

This will be referred to in the Monthly Record.

PHYSICAL AND BIOLOGICAL GEOGRAPHY.

Gravity-force. **Helmert.**

Ergebnisse von Messungen der Intensität der Schwerkraft auf der Linie Kolberg-Schneekoppe. Von F. R. Helmert. Sitzungsberichte der K. Preuss. Akad. der Wissenschaften zu Berlin. Sitzung der physikalisch-mathematischen Classe vom 9 April. xviii. 1896. Size 10 × 7, pp. 6. *Presented by the Author.*

Meteorology. **Mac Dowall.**

Weather and Disease: a Curve History of their Variations in Recent Years. By Alex. B. Mac Dowall. London: the Graphotone Co., 1895. Size 7½ × 5½, pp. 82. *Diagrams. Presented by the Author.*

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Current Charts—Indian Ocean. By Charles Harding. *With Charts.*

Oceanography—Pacific Ocean. *Globus* **69** (1896): 297–302. **Schott.**

Der äquatoriale Stille Ocean und seine Wasserbewegungen. Von Dr. Gerhard Schott. Hamburg. *With Map.*

Physical Geography. **Lapparent.**

Leçons de Géographie physique. Par Albert de Lapparent. Paris: Masson & Cie., 1896. Size 10 × 6¼, pp. xvi. and 590. *Maps and Illustrations. Presented by the Author.*

This important work was specially reviewed in the *Journal* for July, p. 65.

River-regulation. *B.S. Languedocienne G.* **18** (1895): 253–287. **Duponchel.**

Les barrages de retenue et l'aménagement des eaux courantes. Par A. Duponchel.

ANTHROPO-GEOGRAPHY AND HISTORY.

Columbus Documents.

Raccolta di Documenti e Studi pubblicati dalla R. Commissione Colombiana pel Quarto Centenario dalla Scoperta dell' America. Parte ii. Volume i. Rome, 1896. Size 16 × 11½, pp. xii. and 320. *Price* 30*s.*

Historical. *B.S. Khédiv. G.* **4** *s.* (1896): 525–543. **Nallino.**

Al-Khuwarizmi et son remaniement de la Géographie de Ptolémée. Par le Dr. C. Nallino.

An account of the earliest Arab geographical writer whose work, cited by Abulfeda, and believed to be a mere translation of Ptolemy, was discovered in 1878, and found to possess some elements of originality.

Historical—Mediterranean. **Bérard.**

Ann. G. **4** (1895): 271–286, 414–431; **5** (1896): 257–276.

La Méditerranée phénicienne. Par M. V. Bérard. *With Maps.*

This will be specially noticed.

Political Geography. **Leroy-Beaulieu.**

Les Grandes Compagnies de Colonisation. Conférence faite sous le patronage de l'Union Coloniale Française. Par M. P. Leroy-Beaulieu. Paris: L. Chailley, 1895. Size 9 × 6, pp. 36.

A study of British and German chartered companies.

Political Geography. *Petermanns M.* **42** (1896): 97–107. **Ratzel.**

Die Gesetze des räumlichen Wachstums der Staaten. Ein Beitrag zur wissenschaftlichen politischen Geographie. Von Prof. Dr. Friedrich Ratzel.

BIOGRAPHY.

Biographical Dictionary. **Lee.**

Dictionary of National Biography. Edited by Sidney Lee. Vol. xlvi. Pocock-Puckering. London: Smith, Elder, & Co., 1896. Size 10 × 7, pp. vi. and 450. *Price* 15*s.*

The following names of geographical interest are among the notices in the present volume: Richard Pococke, by Warwick Wroth; Sir Gerald Herbert Portal, by C. Alexander Harris; Josias Leslie Porter, by the Rev. Thomas Hamilton, D.D.; Sir Robert Ker Porter, by Thomas Seccombe; Nathaniel Portlock, by Prof. J. K. Laughton; and John Pory, by Miss C. Fell Smith.

Grandidier. *Deutsche Rundschau G.* **18** (1896): 325–329. **Miessler.**
Alfred Grandidier. Von Adolf Miessler. *With Portrait.*

Stapff. *Deutsche Rundschau G.* **18** (1896): 329–331. **Miessler.**
Dr. F. M. Stapff. Von Adolf Miessler. *With Portrait.*

GENERAL.

Admiralty—Hydrographic Office—List of Lights.

The Admiralty List of Lights, 1896. Part i. The British Islands (pp. 210); Part ii. Eastern Shores of the North Sea, and in the White Sea (pp. 188); Part iii. Baltic Sea (pp. 196); Part iv. Western Coasts of Europe and Africa (from Dunkerque to the Cape of Good Hope), including Azores, Madeira, Canary, Cape Verde Islands, etc. (pp. 144); Part v. The Mediterranean, Black, Azov, and Red Seas (pp. 244); Part vi. South Africa, East Indies, China, Japan, Australia, Tasmania, and New Zealand (pp. 240); Part vii. South America, Western Coast of North America, Pacific Islands, etc. (pp. 92); Part viii. Eastern Coasts of North and Central America (from Labrador to the River Amazon), including Bermuda and Islands of the West Indies (pp. 216). London: J. D. Potter, 1896. Size 10 × 6½. *Presented by the Hydrographic Office, Admiralty.*

Bibliography—Deutsches Kolonialblatt.

Inhalts-Verzeichniss zum Deutschen Kolonialblatt. Amtsblatt für die Schutzgebiete des Deutschen Reichs. Herausgegeben in der Kolonial-Abtheilung des Auswärtigen Amts. I. bis V. Jahrgang (1890 bis 1894). Berlin: E. S. Mittler & Son, 1896. Size 10½ × 7½, pp. 94.

An index of the first five years' issue of the *Deutsches Kolonialblatt*, showing the classified contents of the publication.

Bibliography—Marsh Library Catalogue.

University of Vermont. Catalogue of the Library of George Perkins Marsh. Burlington, Vermont: Published by the University, 1892. Size 11 × 8, pp. viii. and 742. *Presented by the University of Vermont.*

British Empire—Telegraphs. *Contemporary Rev.* (1896): 899–908. **Hurd.**
Our Telegraphic Isolation. By Percy A. Hurd.

Church Missionary Atlas.

The Church Missionary Atlas, containing an Account of the various Countries in which the Church Missionary Society labours, and of its Missionary Operations. New Edition (the Eighth). With Thirty-two Coloured Maps. London: Church Missionary Society, 1896. Size 10 × 6½, pp. 240. *Presented by Dr. R. N. Cust.*

A text-Atlas giving prominence to distribution of religions and to mission fields, showing not only the stations of the Church Missionary Society, but also those of most other religious agencies. See note, p. 76.

Health in tropical countries. **Cayley.**

Guide to Travellers on the maintenance of Health in Unhealthy Countries. By Henry Cayley. London: Horace Cox, 1896. Size 6 × 4½, pp. 20. *Price* 1*s. Presented by the Publisher.*

A slightly expanded letter of advice from a medical man to an officer ordered abroad. It contains practical hints on the preservation of health.

Measures. **Dickson.**

Mètre *versus* Pace; or arguments in favour of a Decimal System of British Weights and Measures, founded on a 30-inch Base. By James Dickson. Glasgow: J. C. Erskine, 1891. Size 8½ × 5½, pp. 20. *Diagrams. Presented by the Author.*

Ocean Passages.

Ocean passages for the World. First Edition, 1895. Compiled for the use of seamen, as an aid for ascertaining the route to be followed in the general navigation of the several oceans. London: J. D. Potter, 1895. Size 9½ × 6, pp. 182. *Presented by the Hydrographic Office, Admiralty.*

The first issue of a selection of routes in all seas, and especially ocean passages, collected from the various volumes of sailing directions published by the Admiralty, and brought together for the convenience of mariners.

Smithsonian Institution.

An account of the Smithsonian Institution, its Origin, History, Objects, and Achievements. Washington, 1895. Size 10 × 6½, pp. [28]. *Portraits and Illustrations.*

Travel. **Lunn.**

Travel. Edited by Henry S. Lunn, M.D. Vol. i. No. 1. May, 1896. London: H. Marshall & Son. Size 10 × 7, pp. 58. *Illustrations. Price* 3*d. monthly.*

A new magazine of popular travel.

Travels. **Archduke Franz Ferdinand.**

Tagebuch meiner Reise um die Erde. 1892–1893. Zweiter Band. Wien: Alfred Hölder, 1896. Size 10½ × 7½, pp. 566. *Maps and Illustrations. Presented by the Publishers.*

This volume completes the account of the Archduke's voyage round the world, describing his impressions of Australia, New Guinea, the Malay Archipelago, the coast of China, Japan, the Canadian Rocky Mountains, the Yellowstone Park, and his return to Vienna *viâ* New York and Havre.

Units of geographical measurement. **Staggemeier.**

Le Millionième de la surface terrestre représenté comme une unité convenable pour l'estimation des étendues géographiques. Par Axel Staggemeier, Lieut. Col. Copenhague: Lehmann & Stage, 1896. Size 8 × 5½, pp. 8. *Presented by the Author.*

NEW MAPS.

By J. Coles, *Map Curator*, R.G.S.

EUROPE.

Birmingham. **Bartholomew.**

Plan of Birmingham. Scale 1: 2542 or 0·31 stat. mile to an inch. By John Bartholomew, F.R.G.S. 1896. W. H. Smith & Sons, London. *Price* 1*s. on cloth. Presented by J. Bartholomew & Co.*

England and Wales. **Ordnance Survey.**

Publications issued since June 7, 1896.

1-inch—General Maps:—

England and Wales:—(revision), 301, in outline, 1*s.*
Scotland:—(revision), 1, in outline, 1*s.* 9*d.*

6-inch—County Maps:—

England and Wales:—**Devonshire** (revision), 117 N.E. **Cornwall** (revision), 55 N.W. **Lancashire** (revision), 103 S.W., showing Manchester Ship Canal, 1*s.* each. **Yorkshire**, 21, 34, 2*s.* each.

25-inch—Parish Maps:—

England and Wales:—**Berkshire** (revision), XLIV. 13: XLVI. 9, 13, 1*s.* each. **Durham** (revision), VII. 14, 15; XII. 6, 7, 8, 9, 10, 11; XIII. 6, 3*s.* each. **Essex** (revision), XLII. 6, 9, 10, 11, 14, 15; L. 10, 11, 15; LI. 6, 10, 14; LVIII. 4, 8, 12, 14, 15, 16; LIX. 1, 5; LXVI. 1, 3, 12, 14, 3*s.* each. **Hampshire** (revision), IV. 13: VI. 9, 13; XI. 13, 15, 16; XII. 5, 13; XVIII. 8; XIX. 4, 7, 11, 15; XXII. 12; XXIII. 10, 11, 14; XXX. 3, 4; XXXI. 8, 3*s.* each. **Hertfordshire** (revision), XLVI. 1, 3*s.* each. **Kent** (revision), XLIX. 3, 4, 7, 8, 12, 15, 16, 3*s.* each. **Lancashire** (revision), CXV. 13 (coloured), 11*s.* 6*d.*, showing Manchester Ship Canal. **Middlesex** (revision), VII. 1, 2; X. 8, 11, 12, 15, 16, 3*s.* each. **Northumberland** (revision), LXXXIII. 9, 10, 12, 14, 15, 16, 3*s.* each. **Surrey** (revision), IV. 12, 16; V. 13; X. 6; XI. 1.; XVI. 15, 16; XVII. 8; XXIII. 2, 3, 8, 10, 14; XXIV. 4, 6, 7, 8, 10, 12; XXV. 1, 9, 10, 11, 3*s.* each. **Wiltshire** (revision), LXI. 3, 3*s.* each.

Town Plans—10-feet scale:—

England and Wales:—**Newcastle, Gateshead and Environs** (revision), 76, 86, 91, 111, 2*s.* 6*d.* each. **Tynemouth, North and South Shields** (revision), 60, 72, 2*s.* 6*d.* each. **Wallsend, Jarrow and Environs**, 1, 2, 3, 4, 5, 6, 7, 8, 15, 16, 17, 18, 26, 27, 32, 33, 34, 2*s.* 6*d.* each.

——— 5-feet scale:—

London—Re-survey, XII. 17; XV. 75, 95; XVII. 5, 2*s.* 6*d.* each. The revised edition of London is now complete in 756 sheets, 2*s.* 6*d.* each. Index, 3*d.*

(*E. Stanford, Agent.*)

Germany. **Hickmann.**

Prof. A. L. Hickmann's Geographisch-statistischer Taschen-Atlas des Deutschen Reichs. Erster Teil. Verlag der Kartograph. Anstalt G. Freytag and Berndt. Leipzig und Wien, 1896. *Price* 4 *marks. Presented by the Publishers.*

This is a very nicely-got-up little school atlas, containing a large amount of statistical and geographical information. Care has evidently been taken to make it as attractive and instructive as possible, the graphic system of teaching by the use of sections and diagrams having been largely employed. Although intended for educational purposes, this atlas will prove useful for general reference, as regards Germany.

Ireland. **Bartholomew.**

The Tourists' Map of Ireland. Scale 1: 633,000 or 10 miles to an inch. By John Bartholomew, F.R.G.S. 1896. Edinburgh: J. Bartholomew & Co. *Price 2s. on cloth. Presented by the Publishers.*

Manchester. **Bartholomew.**

Plan of Manchester and Salford. Scale 300 yards to an inch. By John Bartholomew, F.R.G.S. 1896. London: W. H. Smith & Sons. *Price 2s. on cloth. Presented by J. Bartholomew & Co.*

Rome. **Schneider.**

Das alte Rom. Entwickelung seines Grundrisses und Geschichte seiner Bauten, auf 12 Karten und 14 Tafeln dargestellt, und mit einem Plane der heutigen Stadt sowie einer Stadtgeschichtlichen Einleitung. Herausgegeben von Arthur Schneider. Leipzig: Druck und Verlag von B. G. Teubner, 1896.

This atlas contains maps, plans, and illustrations of Ancient Rome, from the earliest times to the fourth century after Christ. By an ingenious arrangement, a comparison of the ancient city at different periods and its present condition can easily be made. This is accomplished by placing one of the ancient plans, which are printed on tracing-paper, over a modern plan printed on cardboard, on the same scale. The illustrations are numerous, and have been selected to show, on each sheet, the public buildings that were erected at different periods. The whole is accompanied by explanatory letterpress.

ASIA.

China. **Villard.**

Map of the Yangtse-Kiang in 13 sheets, from its mouth to Chungking, and general chart from mouth to source, with plans of Shanghai, Chinkiang, Nanking, Wuhu, Kiukiang, Hankow, Ichang, and Chungking, Lights, etc. Scale 1: 185,000 or 2·5 stat. miles to an inch. By R. A. de Villard. Shanghai, 1895. *Price* £1 15*s.*

The contents of this map are fully described in the title. One of the principal features is that the names of places are written in both English and Chinese.

India. **Survey of India Department.**

Chart (on Mercator's projection) of the Tidal and Levelling operations of the Survey of India Department, 1858–95, showing approximate cotidal lines. Scale 1: 6,500,000 or 102 stat. miles to an inch. *Presented by Lieut. C. C. D. Morice, R.E., Survey of India Department.*

Indian Government Surveys. **Surveyor-General's Office, Calcutta.**

Indian Atlas, 4 miles to an inch. Quarter-sheets: 9 N.W., parts of districts Shikarpur and Hyderabad, and of Khairpur Native State (Sind, Bombay Presidency); 21 S.E., parts of Palanpur and Mahi Kantha agencies, of Native State Baroda (Bombay), and of Oodeypore (Rajputana); 26 N.E., part of district Ratnagiri (Bombay Presidency); 49 S.W., parts of districts Delhi, Gurgaon, Rohtak, and Hissar, and of Native States Patiala Jind, Loharu, and Nabha (Punjab), Jeypore and Ulwur states (Rajputana); 50 N.W., parts of Native States Jeypore, Ulwur, and Bhurtpore (Rajputana Agency), Patiala and district Gurgaon (Punjab); 69 N.W., parts of Gwalior and Bundelkhand (Central India Agency), and of districts Jalaun, Jhansi, Hamirpur and Etwah (N.W. Provinces); 126 S.E., parts of districts Noakhali, Chittagong, South Lushai Hills, Native State Hill Tippera (Bengal), and of North Lushai Hills (Assam).—Railway Map of India. Railways brought up to October, 1895, 1 inch to 48 miles, 4 sheets.—India, 128 miles to an inch, December, 1895.—Punjab and Kashmir, 16 miles to an inch, November, 1895. —Lower Provinces Revenue Survey, 1 inch to a mile, Sheets Nos. 3 and 4, district 24, Purgunnaks.—Bengal Survey, 1 inch to a mile, Seasons 1850–1884, Sheet No. 8, parts of Rewah State (Central India Agency), Sarguja and Koria of Garhjat States (Bengal), and district Mirzapur (N.W. Provinces); No. 270 (Preliminary edition), districts Darjeeling and Jalpaiguri; No. 349, districts Mymensingh, Dacca, Faridpur, and Pabna; No. 377, districts Mymensingh and Dacca. —Bombay Survey, 1 inch to a mile, Seasons 1893–94. Sheets Nos. 334 and 335, district Dharwar and Native States Sangli, Miraj (Senior and Junior), and Savanur (Dharwar Agency).—North-West Provinces and Oudh Survey, 1 inch to

a mile, Seasons 1865–68–69 and 82–84. Sheet No. 187, parts of Rewah State (Central India Agency), Sarguja and Koria of Garhjat States (Bengal), and district Mirzapur (N.W. Provinces).—Central India and Rajputana Survey, 1 inch to a mile, Seasons 1865–68–69 and 82–84; No. 483, parts of Rewah State (Central India Agency), Sarguja and Koria of Garhjat States (Bengal), and district Mirzapur (N.W. Provinces).—Central Provinces Survey, 1 inch to 2 miles, Seasons 1862–65. Sheets Nos. 206, 207, 224, and 225 (on one), parts of district Raipur and its Zemindaries, Bindra-Nawagarh, Phingeswar and Khariar; also of district Sambalpur and its Garhjat States, Patna, Borasamar, and Phuljhar (Central Provinces).—Indus Riverain Survey, 1 inch to a mile, Season 1893–94. Sheets: No. 23, districts Shikarpur, Karachi, and Hyderabad; No. 24, districts Karachi and Hyderabad; No. 25, districts Karachi and Hyderabad; No. 26, districts Karachi and Hyderabad; No. 27, district Karachi; No. 41, district Shikarpur and Khairpur State; No. 42, districts Shikarpur, Hyderabad, and Khairpur State; No. 43, districts Karachi and Hyderabad; No. 45, district Hyderabad; No. 46, districts Karachi and Hyderabad; No. 47, districts Karachi and Hyderabad; No. 48, districts Karachi and Hyderabad; No. 68, district Hyderabad.—Upper Burma Surveys, 1 inch to a mile, Seasons 1889–93. Sheets: No. 166, districts Sagaing and portion of Lower Chindwin; No. 167, districts Sagaing and portion of Lower Chindwin; No. 168, district Sagaing; No. 213, district Sagaing; No. 214, district Sagaing; No. 215, district Sagaing; No. 216, district Sagaing; No. 259, district Mandalay and Shwebo; No. 260, districts Mandalay, Sagaing, and Schwebo; No. 262, districts Kyaukse and Sagaing.—South-Eastern Frontier, 1 inch to 4 miles, Seasons 1853–61 and 1883–92. Sheet No. 2 N.W., parts of districts Chittagong (Bengal), of Northern Arakan and Akyab (Lower Burma), and of Chin Hills (Upper Burma).—District Almora, N.W. Provinces and Oudh, 1 inch to 16 miles, 1895.—Sub-division Chittagong Hill Tracts, Bengal, 1 inch to 8 miles, 1890.—District Hamirpur, N.W. Provinces and Oudh, 1 inch to 8 miles, 1896.—District Hoshangabad, Central Provinces, 1 inch to 12 miles, 1895.—District Lucknow, N.W. Provinces and Oudh, 1 inch to 8 miles, 1895.—District Mymensingh, Bengal, 1 inch to 8 miles, 1892.—District Puri, Bengal, 1 inch to 8 miles, 1890.—District Tippera, Bengal, 1 inch to 8 miles, 1892.—Index to the standard sheets of Bengal additions to 1895.—Chart of Triangulation and Traversing Gujarat Survey, ½ inch to a mile. Degree Sheets VIII. and IX., Seasons 1883–88. *Presented by H.M. Secretary of State for India through the India Office.*

AFRICA.

South Africa. **Johnston.**

South Africa, constructed by W. & A. K. Johnston, Edinburgh and London. Scale 1: 1,480,000 or 23·4 stat. miles to an inch. *Price* 12*s*. *Presented by the Publishers.*

This map is drawn in a bold style suitable for use in schools. It shows accurately the present state of railway communication in South Africa, and a table is given of the electoral divisions of the Cape Colony. The map is not overcrowded with names.

Sudan. **Bartholomew.**

Bartholomew's Special Large-Scale Map of the Sudan scale 1: 2,000,000 or 31·5 miles to an inch, with General Map of North-East Africa and enlarged plan of Khartum. John Bartholomew & Co., Edinburgh. *Price* 1*s*. *Presented by the Publishers.*

The large-scale map of the Sudan includes the valley of the Nile from Korosko to some distance above Khartum, and extends on the east to the Red Sea. All the caravan routes across the desert are shown. The general map extends from the Mediterranean to Lake Nyasa, and from the Upper Congo region to the Indian Ocean. It will be useful to all who wish to follow the course of events in the Nile valley at the present juncture.

AMERICA.

California. **Sierra Club.**

Map of the Sierra Nevada Mountains of Central California. Publication No. 12 of the Sierra Club. Scale 1: 253,440 or 4 stat. miles to an inch. Berkeley, Cal., 1896. *Price* $1.50. *Presented by the Sierra Club.*

The previous edition of this map was noticed in the *Geographical Journal*, August, 1893. The present has been compiled for the Sierra Club by Mr. J. N. Le Conte, from the latest published sources, and from observations and explorations made by himself and other members of the club. Insets on an enlarged scale are given of the Hetch-Hetchy and Yosemite valleys.

Venezuela. **Sievers.**

Nördliches Venezuela von W. Sievers. I. Übersicht der geologischen und tektonischen Verhältnisse. Scale 1 : 3,000,000 or 47·5 geo. miles to an inch. Petermann's 'Geographische Mitteilungen.' Jahrgang 1896. Tafel 6. *Presented by the Publisher.*

GENERAL.

The World. **Johnston.**

The World-Wide Atlas of Modern Geography, Political and Physical. Containing one hundred and twelve plates and complete Index. With an Introduction by J. Scott Keltie. Third edition. W. & A. K. Johnston, Edinburgh and London, 1896. *Price* 7*s.* 6*d.* *Presented by the Publishers.*

This is the third edition of an atlas which has been favourably noticed on a previous occasion.

The World. **Saint-Martin and Schrader.**

Atlas Universel de Géographie construit d'après les sources originales et les documents les plus recents, cartes, voyages, mémoires, travaux géodésiques, etc. Avec un Texte Analytique. Ouvrage commencé par M. Vivien de Saint-Martin et continué par Fr. Schrader. 84 Cartes gravées sur cuivre sous la direction de MM. E. Collin et Delaune. Sheet No. 57, Afrique Physique. 1 : 20,000,000 or 31·5 stat. miles to an inch. Paris: Librairie Hachette et Cie.

This is a reduction of the three-sheet map of Africa which has already been published in this atlas on the scale of 1 : 10,000,000. Where necessary it has been corrected, use having been made of the work of all the more recent explorers. It is orographically coloured in five tints, and the depths of the ocean shown, up to 6000 metres, in seven shades of blue. Accompanying the map is a note in which all the authorities consulted in its construction are mentioned.

CHARTS.

Chilian Charts. **Oficina Hidrográfica, Chile.**

Planos de la Costa Chile. No. 56, Caleta Esmeralda. No. 57, Croquis de Puerto Harriss, Bahía Porvenir. No. 58, Bahía de Conchalí i Puerto Vilos. Taller de la Oficina Hidrográfica de Chile, 1896. *Presented by the Chilian Hydrographic Office.*

Indian Ocean. **Admiralty.**

Monthly Current Charts for the Indian Ocean. Published at the Admiralty, 1896, under the superintendence of Rear-Admiral W. J. L. Wharton, C.B., F.R.S. Hydrographer. London. *Price* 7*s.* *Presented by the Hydrographic Department, through the Hydrographer.*

A full notice of this important atlas will appear on a future occasion.

ASTRONOMICAL.

Star Chart. **Russell.**

Chart of Southern Circumpolar Stars, made in Sydney Observatory under the direction of H. C. Russell, Astronomer.

All stars down to the sixth magnitude, whose declination is greater than 45° S., are shown on this chart. Star-magnitudes are indicated by well-chosen symbols, and, as the chart is drawn in a clear and bold style, it should be useful to those who may have occasion to observe southern circumpolar stars.

PHOTOGRAPHS.

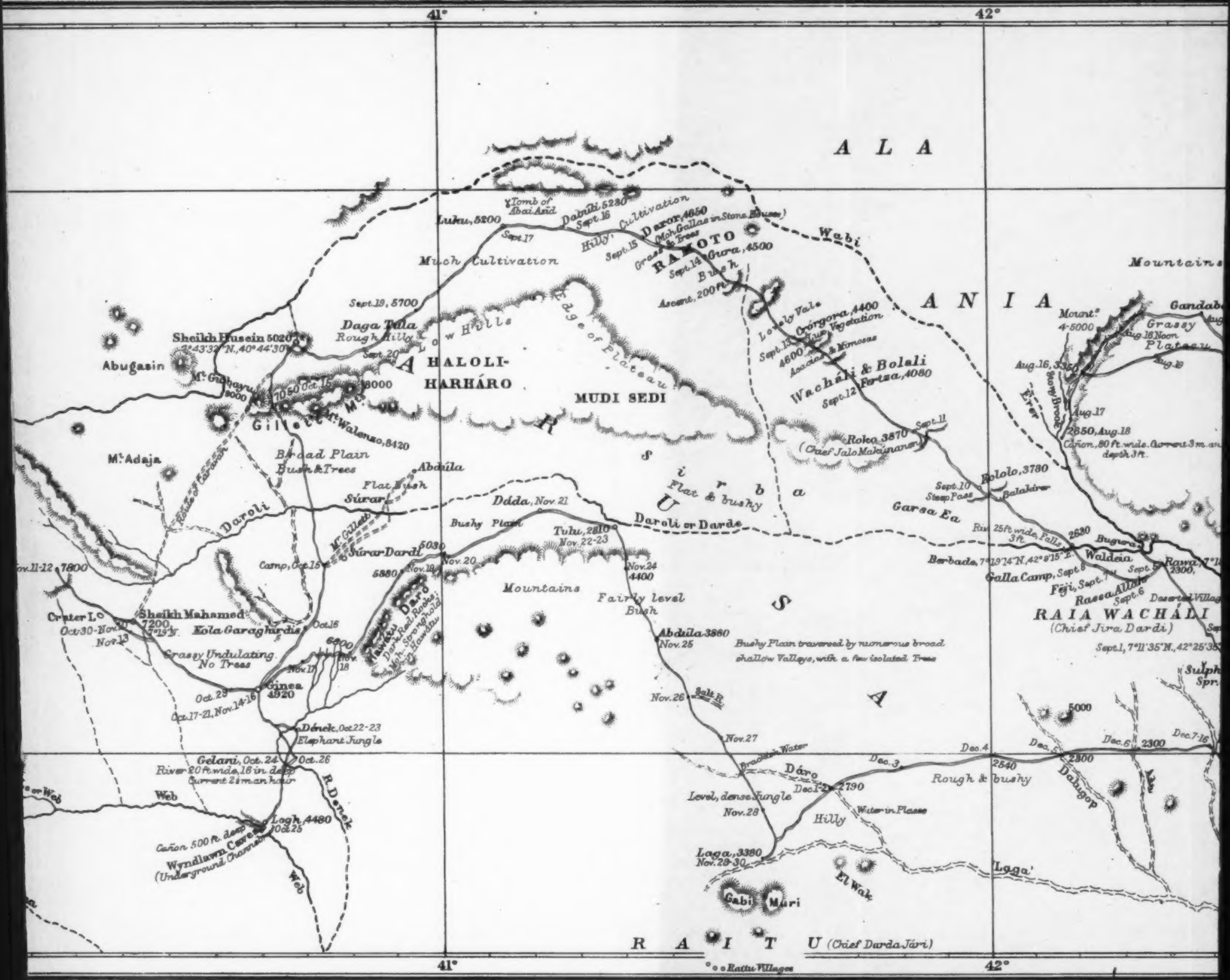
India and Andaman Islands. **Whitehouse.**

Seventeen photographs of India and Andaman Islands, including enlarged photograph of Mount Everest from Sandakfu, taken by Lieut. Whitehouse, R.N. *Presented by Lieut. Whitehouse, R.N.*

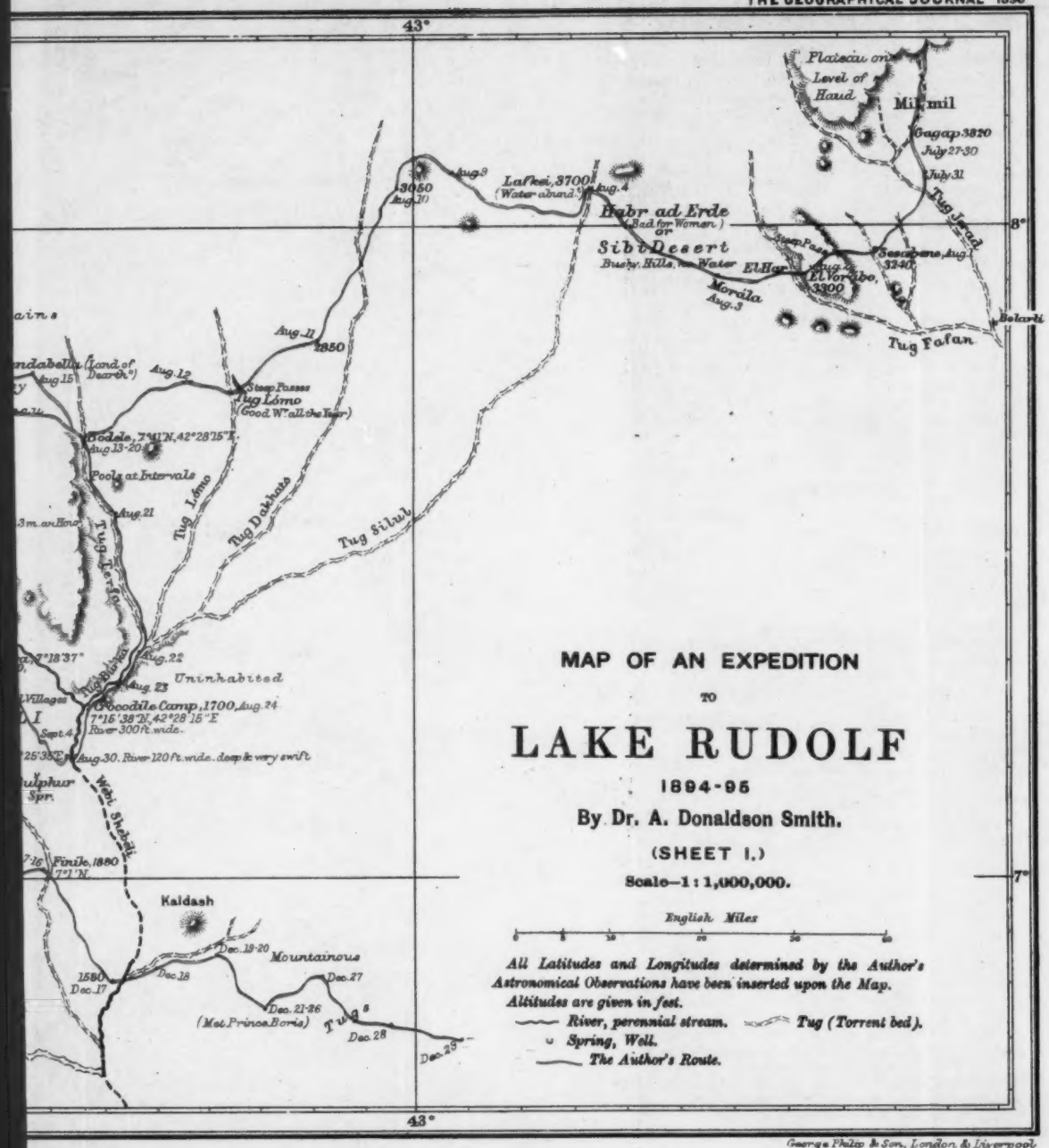
This is an interesting set of photographs. They are all good specimens, and convey an excellent idea of the scenery. The view of Mount Everest from Sandakfu is worthy of special commendation. It is a framed enlargement, and has been hung in the Society's house.

N.B.—It would greatly add to the value of the collection of Photographs which has been established in the Map Room, if all the Fellows of the Society who have taken photographs during their travels, would forward copies of them to the Map Curator, by whom they will be acknowledged. Should the donor have purchased the photographs, it will be useful for reference if the name of the photographer and his address are given.

8°
Bh
Bud
Grassy
7°
Worigom
Rug
Wa
Wabi Wabu



Published by the Royal Geographical Society



MAP OF AN EXPEDITION

TO

LAKE RUDOLF

1894-95

By Dr. A. Donaldson Smith.

(SHEET 1.)

Scale—1 : 1,000,000.

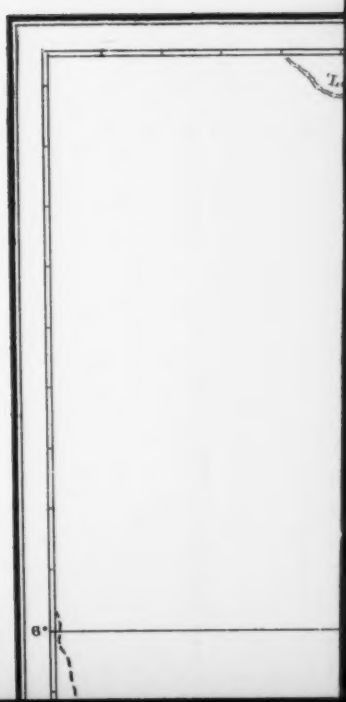
English Miles

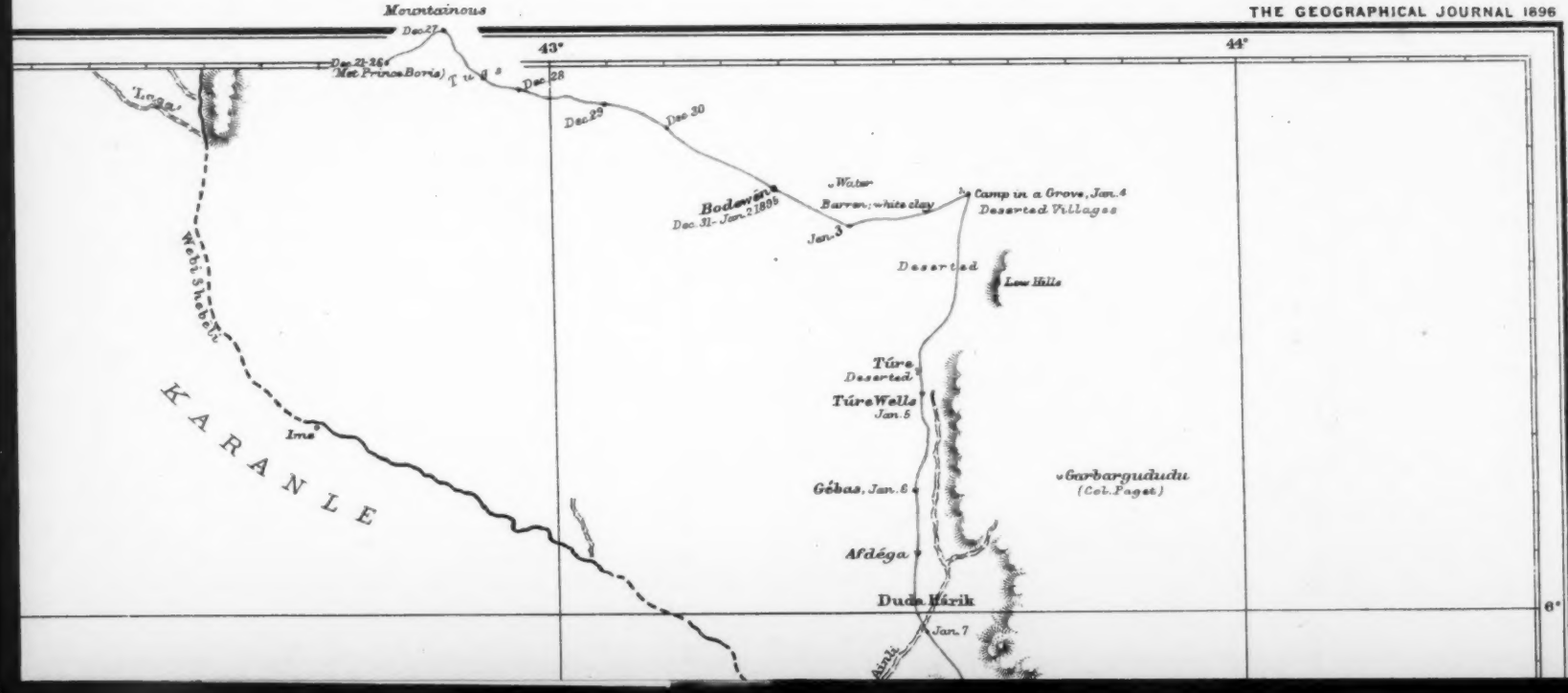
0 5 10 20 30 40

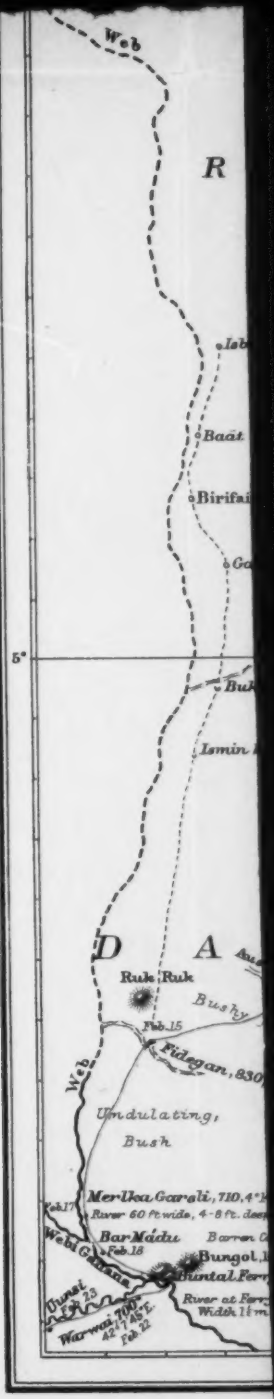
All Latitudes and Longitudes determined by the Author's Astronomical Observations have been inserted upon the Map.
Altitudes are given in feet.

River, perennial stream. *Tug (Torrent bed).*
Spring, Well.
The Author's Route.

George Philip & Son, London & Liverpool


6°


Mountainous
Dec. 27
Dec. 25-26
Mt. Prince Boris)
Dec. 28
Dec. 29
Dec. 30
43°
44°
Water
Barren; white clay
Camp in a Grove, Jan. 4
Deserted Villages
Bodewin
Dec. 31- Jan. 2 1896
Jan. 3
Deserted
Low Hills
Túre
Deserted
Túre Wells
Jan. 5
Webi Sheeli
KARANLE
Ime
Gébas, Jan. 6
Garbargududu
(Col. Paget)
Afdéga
Duda Hárik
Jan. 7
6°


Web
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Bul
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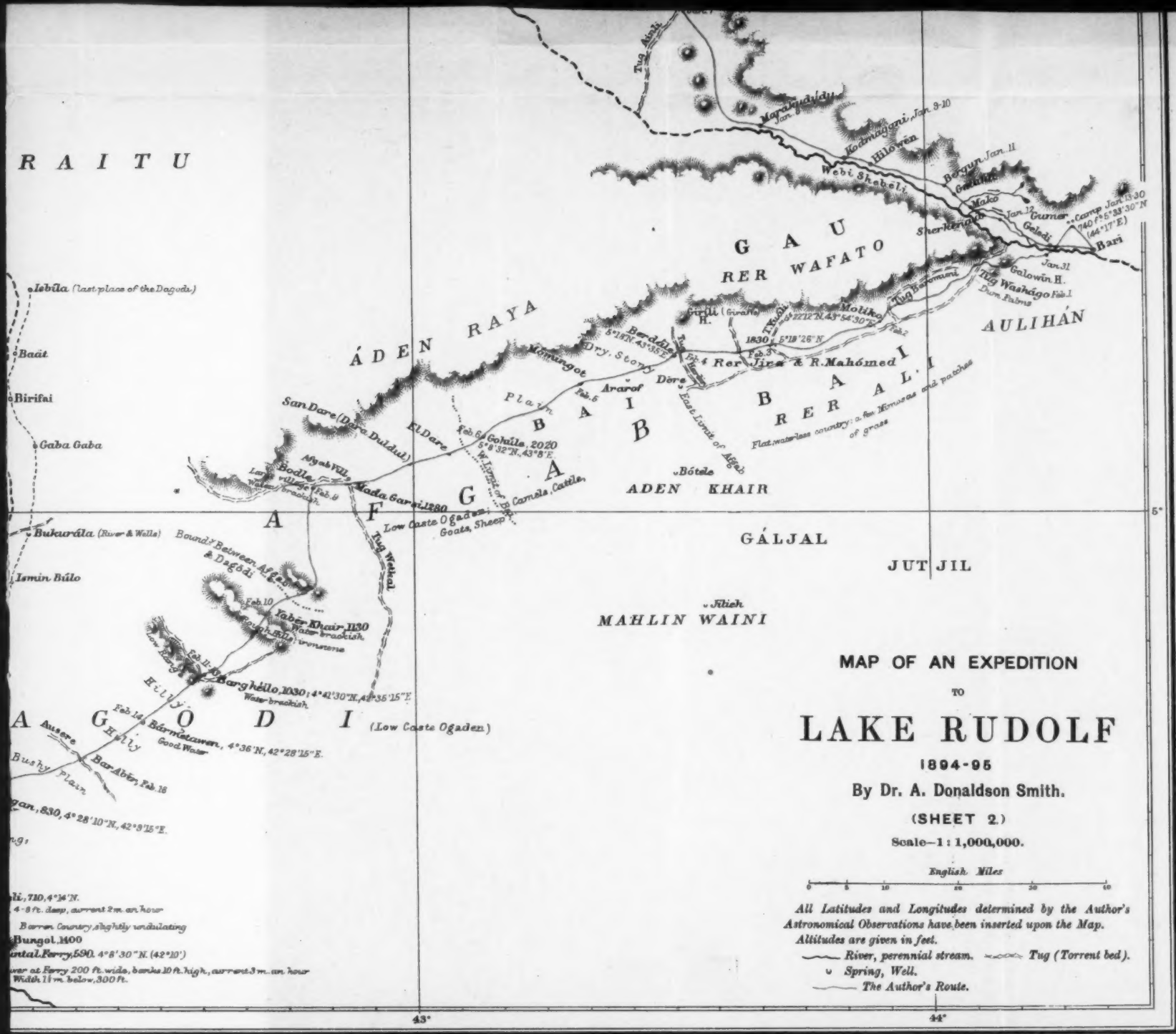
D
A
Rule Ruk
Bushy
Feb. 15
Fidegan, 830
Web
Undulating
Bush
Merlka Garali, 710, 4°
River 60 ft. wide, 4-8 ft. deep
Feb. 17
Bar Madu
Barren
Feb. 18
Web Ghana
Bungol
Buntal Ferry
River at Ferry
Width 1½ m.
Dusai
Feb. 23
Warwai, 710
42° / 45° E.
Feb. 22


RAITU
Tug Ashi
Kodmägni, Jan. 9-10
Hilowen
Webi Shabeli
Bergun Jan. 11
Mako
Jan. 12 Gurner
Camp Jan. 13-30
740 ft. 5° 33' 30" N
44° 17' E
Bari
Jan. 31
Galowin R.
Tug Washágo Feb. 1
Dum Palms
GAU
RER WAFATO
AULIHÁN
Iebúla (last place of the Dagodi)
Baát
Birifai
Gaba Gaba
ÁDEN RAYA
Gurili (Giraffe) R.
Moliko
Tug Bessmani
Tug Ashi
1830 5° 19' 26" N
Feb. 3
Feb. 4 Rer Jira & R. Mahómed
Mamingot
Dry Stony Plain
Bodlle 5° 18' N. 43° 35' E
Araref
Dere
East Limit of Algab
BAIBAI BERAL
Flat waterless country: a few Mimosas and patches of grass
San Dare (Dere Duldul)
El Dare
Feb. 6 Gohalle, 2020 5° 8' 32" N. 43° 8' E
W. Limit of Algab
Camels, Cattle
Afgab Vill.
Bodle village Feb. 9
Lake
Water brackish
Soda Bar, 1280
Bótele
ADEN KHAIR
AFGAG
Low Caste Ogaden Goats, Sheep
GÁLJAL
JUT JIL
Bukaréla (River & Wells)
Boundary Between Afgab & Dagódi
Ismin Búlo
Feb. 10
Yabér Khair, 1130
Water brackish
Intermittent
Feb. 11 Bargh'llo, 1030; 4° 41' 30" N, 42° 35' 15" E
Water brackish
Tug Wetkal
Jilich
MAHLIN WAINI
HILLY
ODI (Low Caste Ogaden)
Feb. 14 Bármataan, 4° 36' N, 42° 28' 15" E.
Good Water
Ausere
Hilly
Bushy Plain
Bar-Abtir, Feb. 16
Burgol, 1400
Feb. 18
Feb. 19
Feb. 20
Feb. 21
Feb. 22
Feb. 23
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Feb. 28
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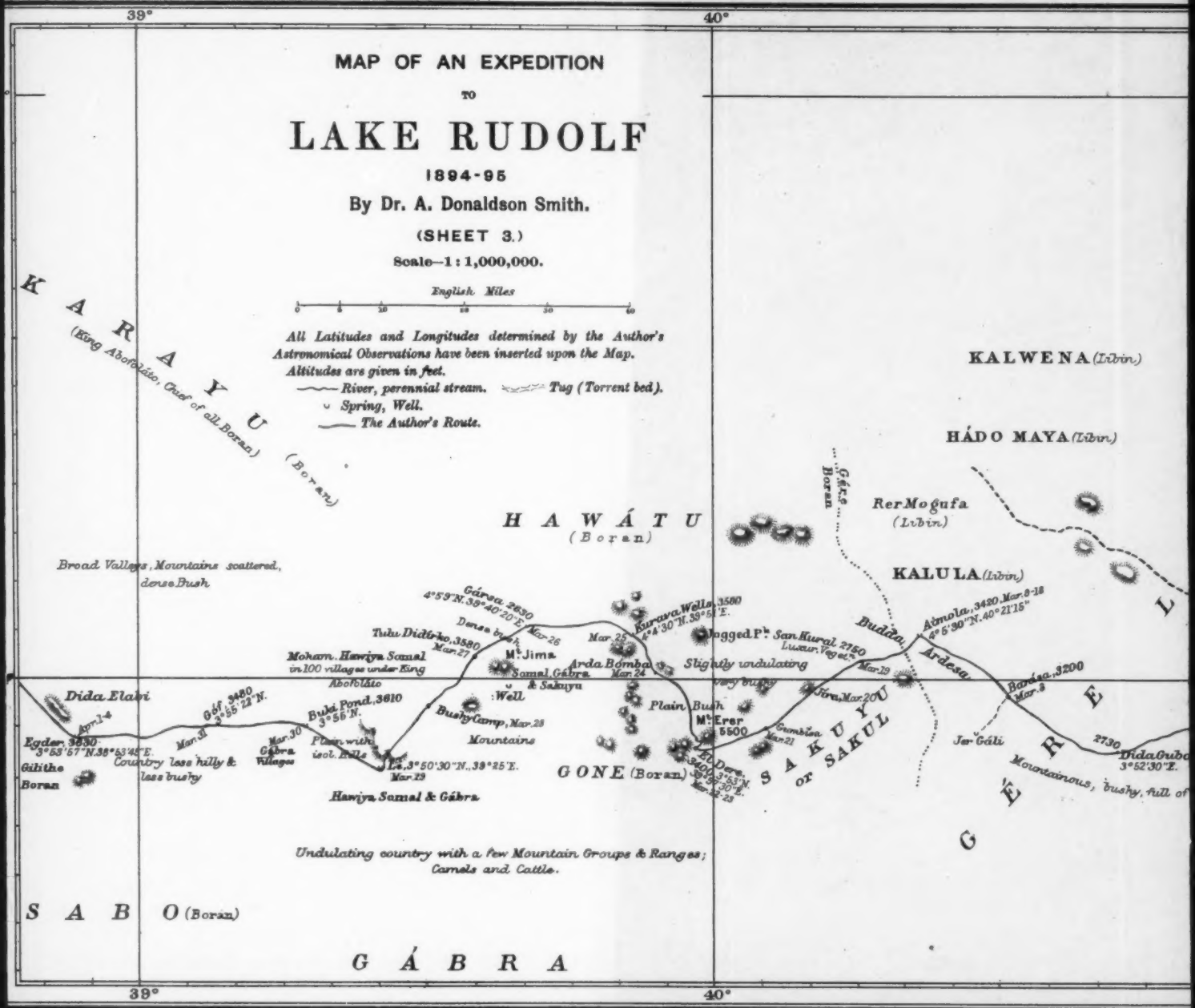

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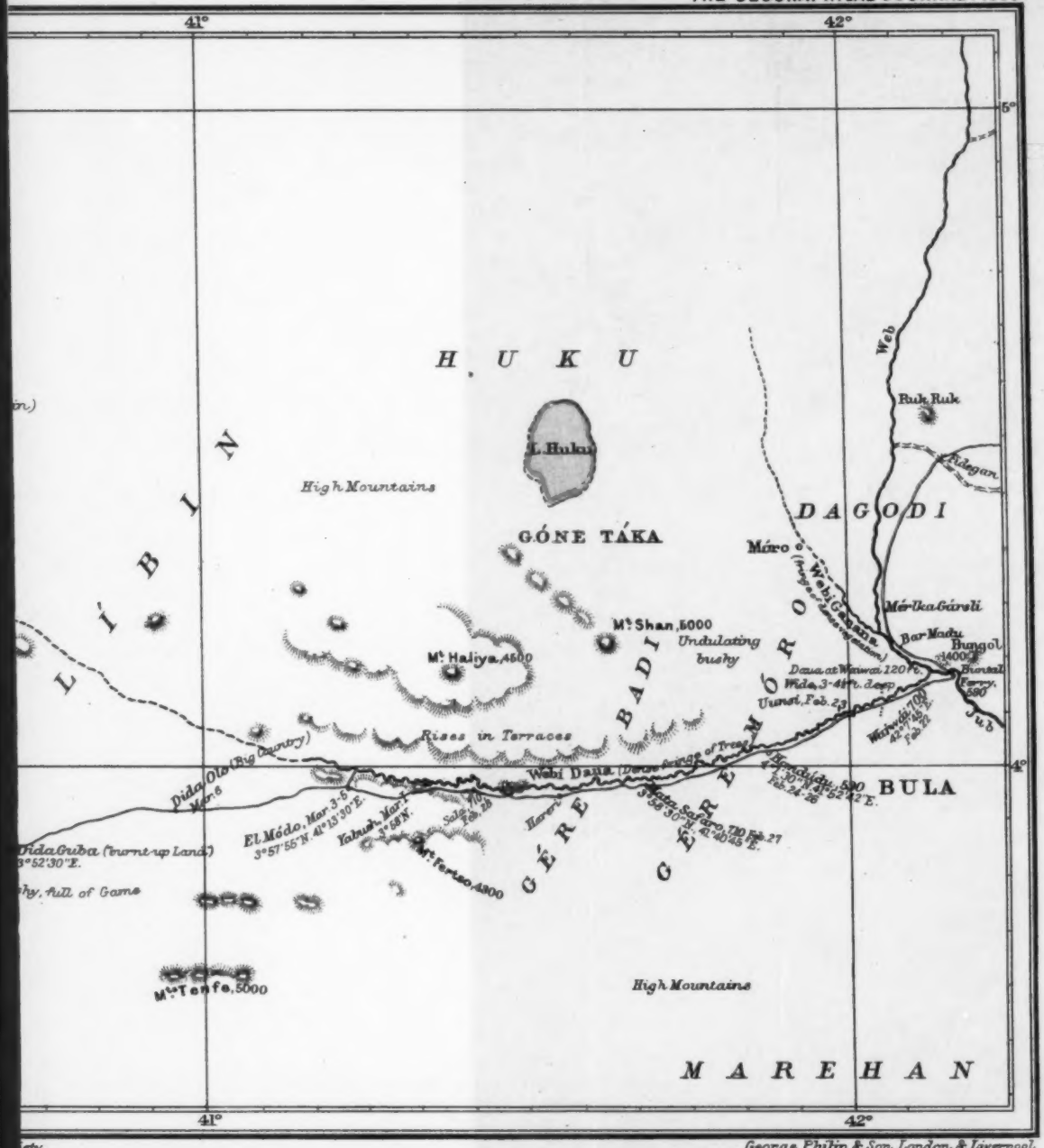
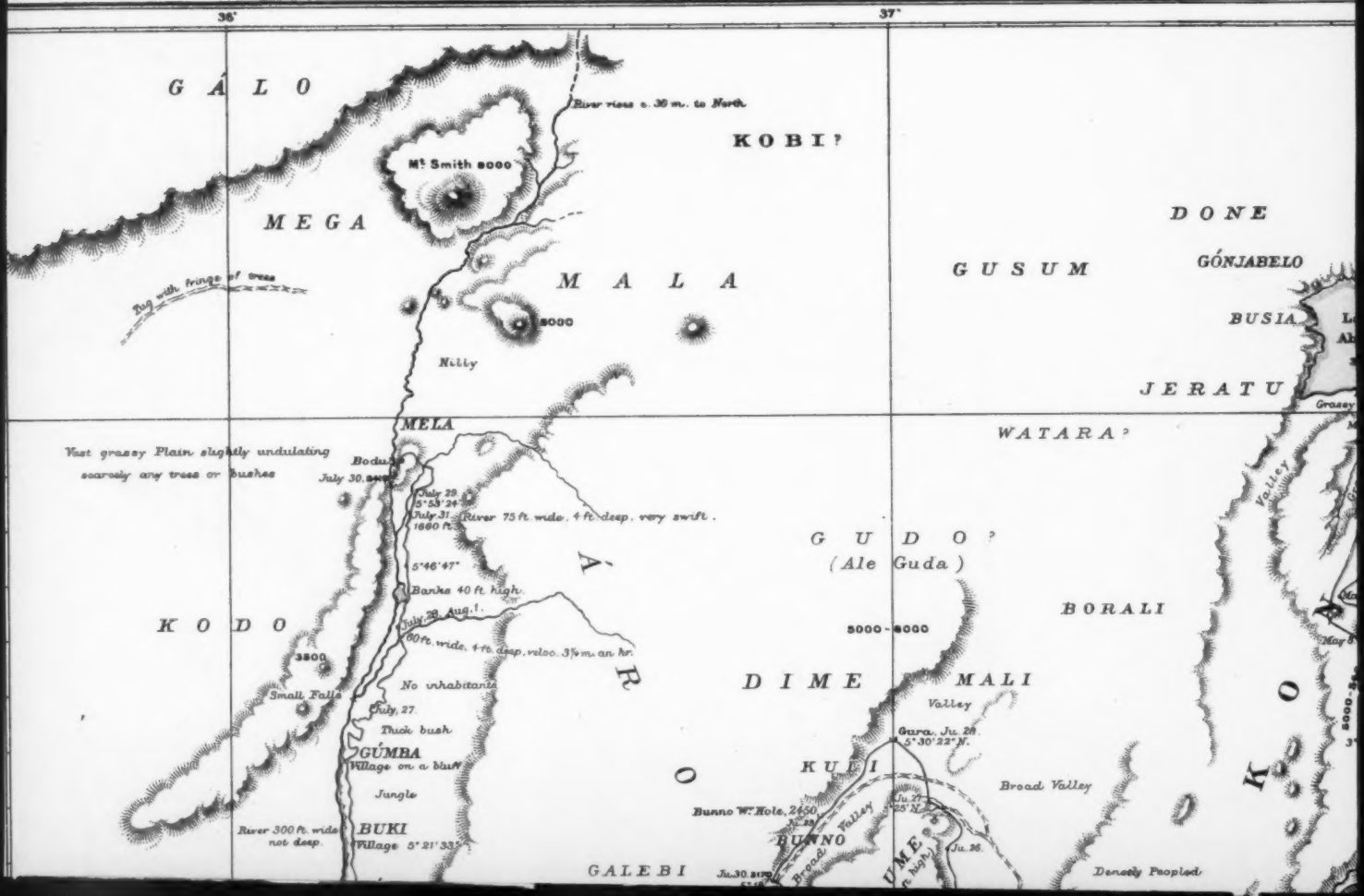

41°
42°
5°
4°
H U K U
L. Huku
High Mountains
GÓNE TÁKA
L I B I N
DAGODI
Máro
Wabi Ganana
Rak Rak
Web
Márka Gáreli
Bar Madu
Bungol
1400 ft.
Buntal
Ferry, 590
Jub
Dana at Wamara, 120 ft.
Wide, 3-4 m. deep
Usual, Feb. 23
Mt Shan, 5000
Undulating bushy
Mt Haliya, 4500
Rises in Terraces
BADI
GÉRE MÓRO
Wabi Dana
Dida Olo (Big Country)
Mar. 6
Dida Guba (Front-up Land)
3°52'30" E.
El Mádo, Mar. 3-5
3°57'55" N. 41°13'30" E.
Yabush, Mar. 7
3°58' N.
Mt Tenfe, 4300
Mt Tenfe, 5000
GÉRE
BULA
MARE HAN
George Philip & Son, London & Liverpool


36°
37°
GALO
MEGA
MALA
KOBI?
DONE
GUSUM
GÓNJABELO
BUSIA
JERATU
WATARA?
MELA
KODO
GUDO?
(Ale Guda)
BORALI
DIME
MALI
KULI
BUNNO
GALEBI
GUMBA
BUKI
Mt Smith 8000
River rises c. 30 m. to North
Rug with fringe of trees
Nilly
Vast grassy Plain slightly undulating
scarcely any trees or bushes
Bodu
July 30.
July 28
5°53'24"
July 31
1660 ft.
River 75 ft. wide, 4 ft. deep, very swift.
5°46'47"
Banks 40 ft. high.
July 28 Aug. 1.
90 ft. wide, 4 ft. deep, veloc. 3½ m. an hr.
No inhabitants
July, 27.
Thick bush
Village on a bluff
Jungle
Small Falls
River 300 ft. wide
not deep.
Village 5°21'33"
Valley
Gara. Ju. 28.
5°30'22" N.
Broad Valley
Bunno W. Hole, 2450
Ju. 27
25' N.
Ju. 26.
Densely Peopled
3800
5000 - 8000

MAP OF AN EXPEDITION

TO

LAKE RUDOLF

1894-95

By Dr. A. Donaldson Smith.

(SHEET 4.)

Scale—1 : 1,000,000.

English Miles

0 5 10 20 30 40

All Latitudes and Longitudes determined by the Author's Astronomical Observations have been inserted upon the Map.
Altitudes are given in feet.

River, perennial stream. *Tug (Torrent bed).*
Spring, Well.
The Author's Route.

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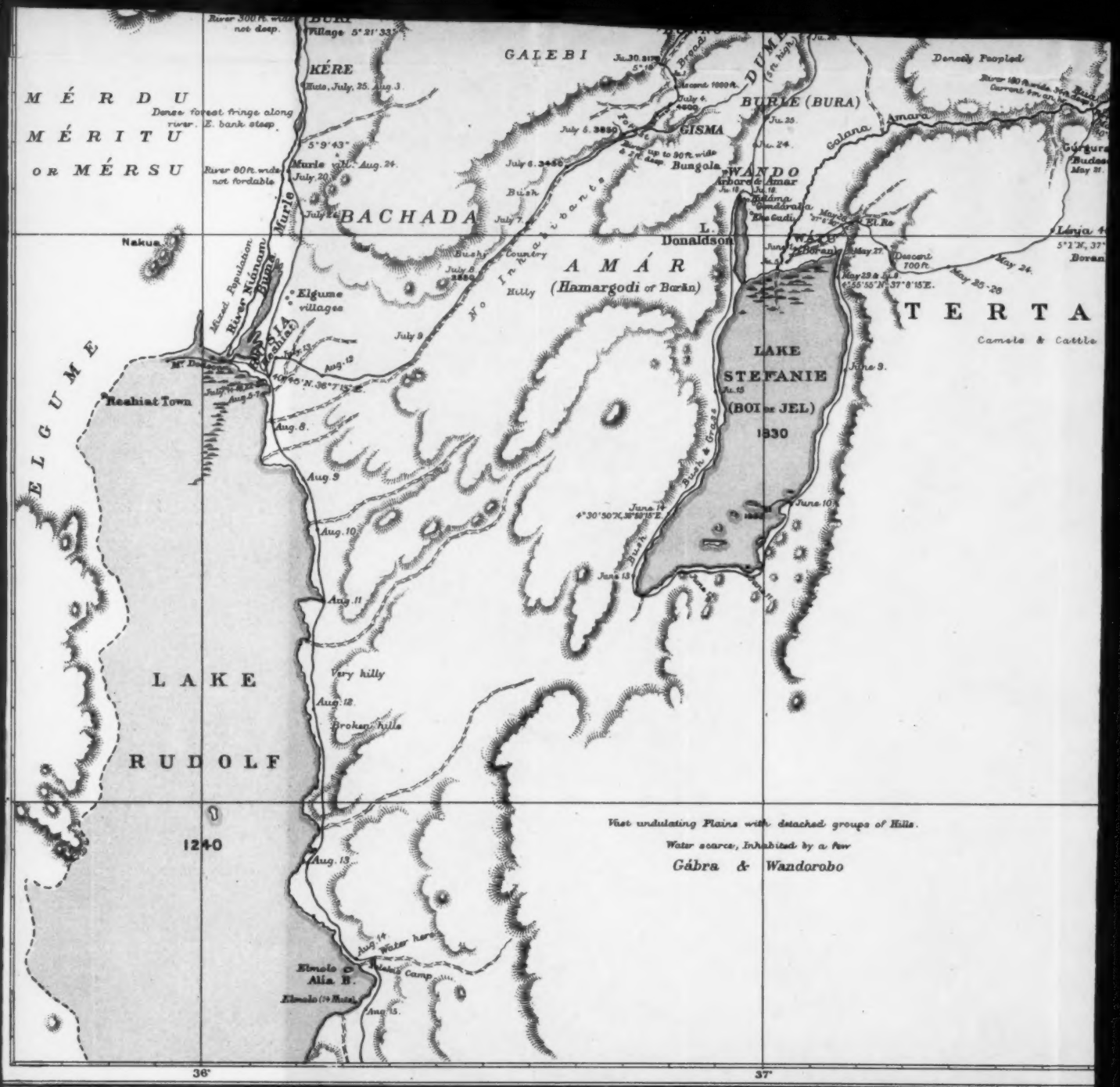

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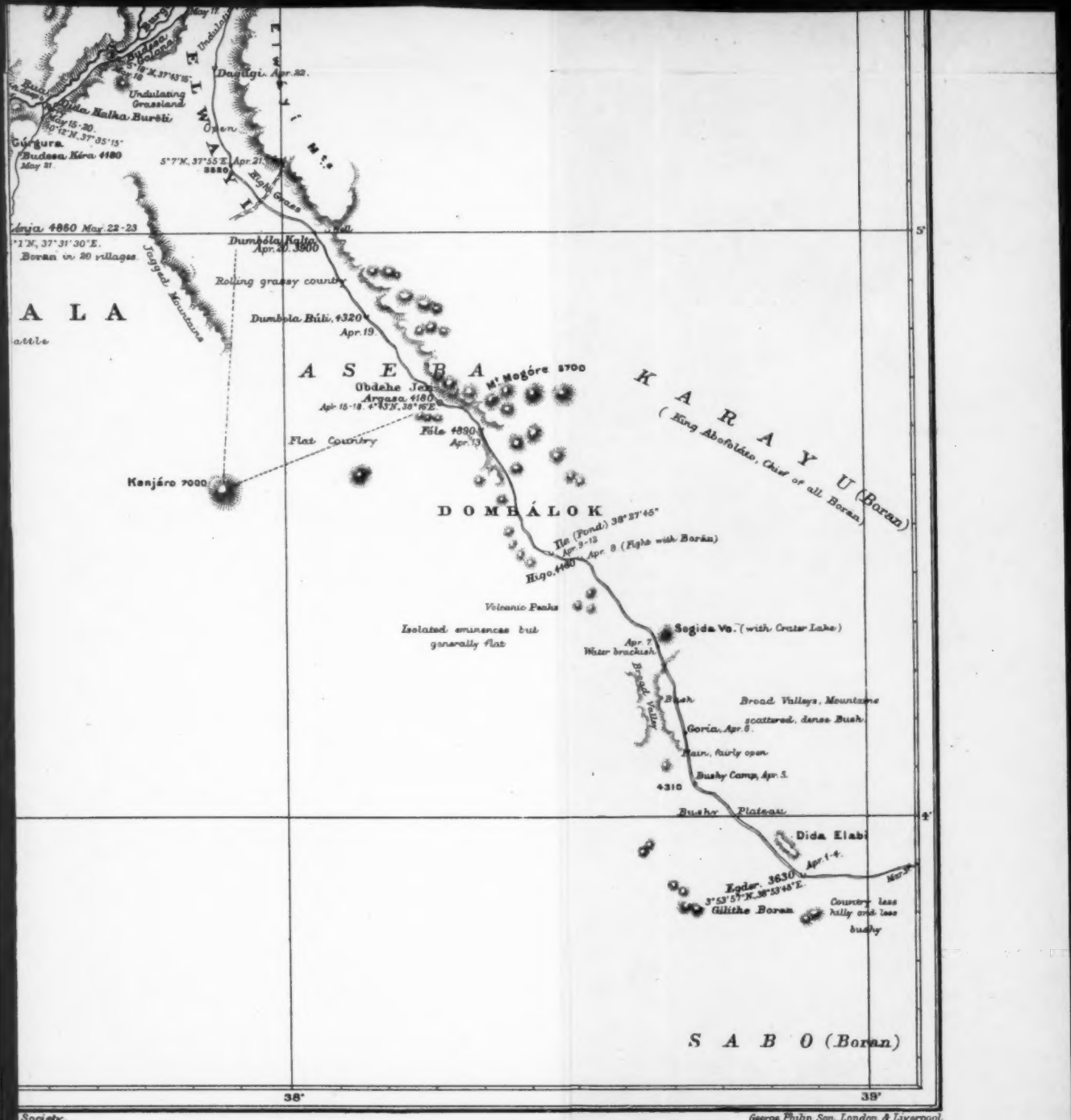
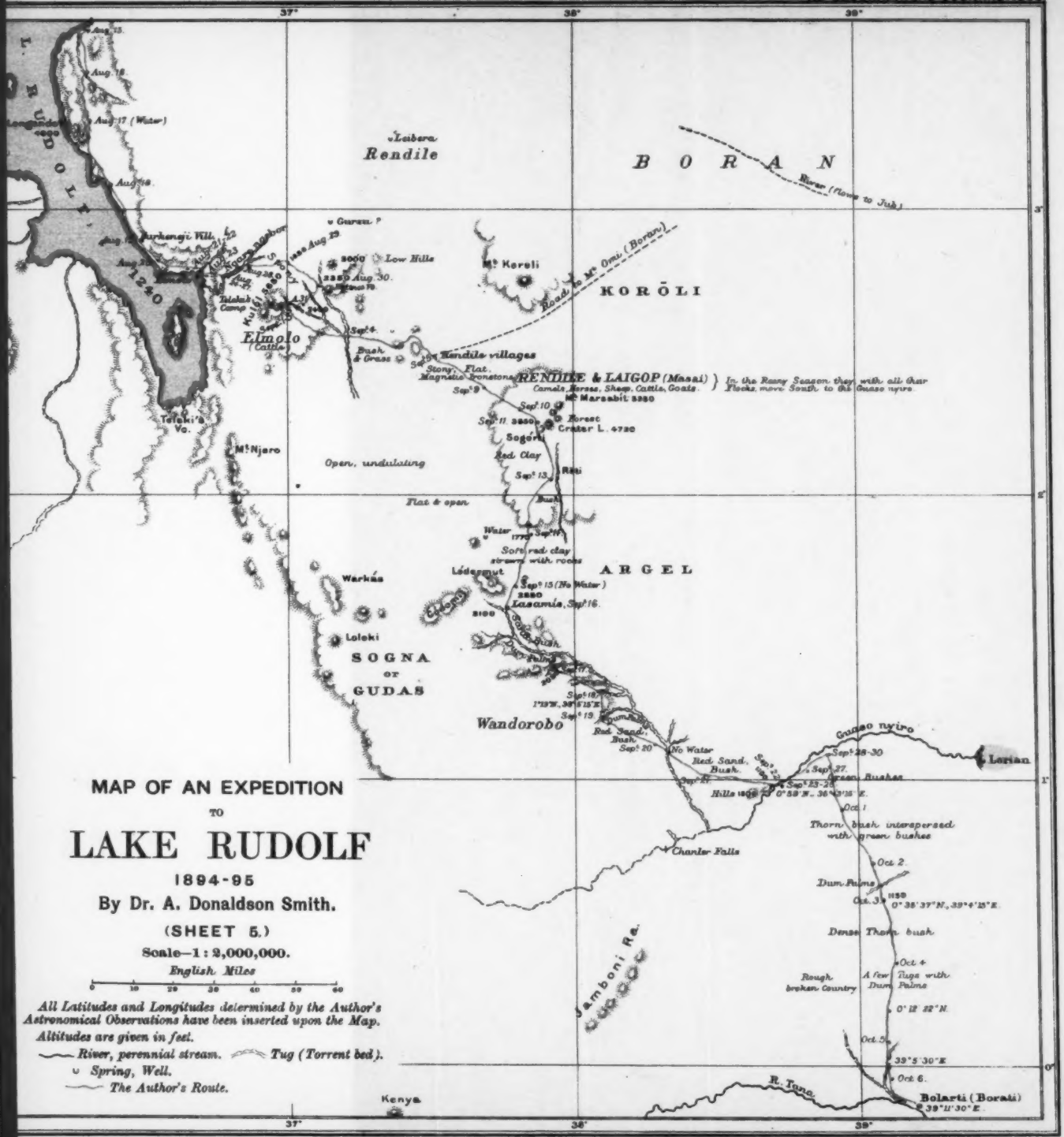


Society.

George Philip Son, London & Liverpool.



MAP OF AN EXPEDITION
TO
LAKE RUDOLF
1894-95

By Dr. A. Donaldson Smith.

(SHEET 5.)

Scale—1 : 2,000,000.

English Miles

0 10 20 30 40 50 60

All Latitudes and Longitudes determined by the Author's Astronomical Observations have been inserted upon the Map.

Altitudes are given in feet.

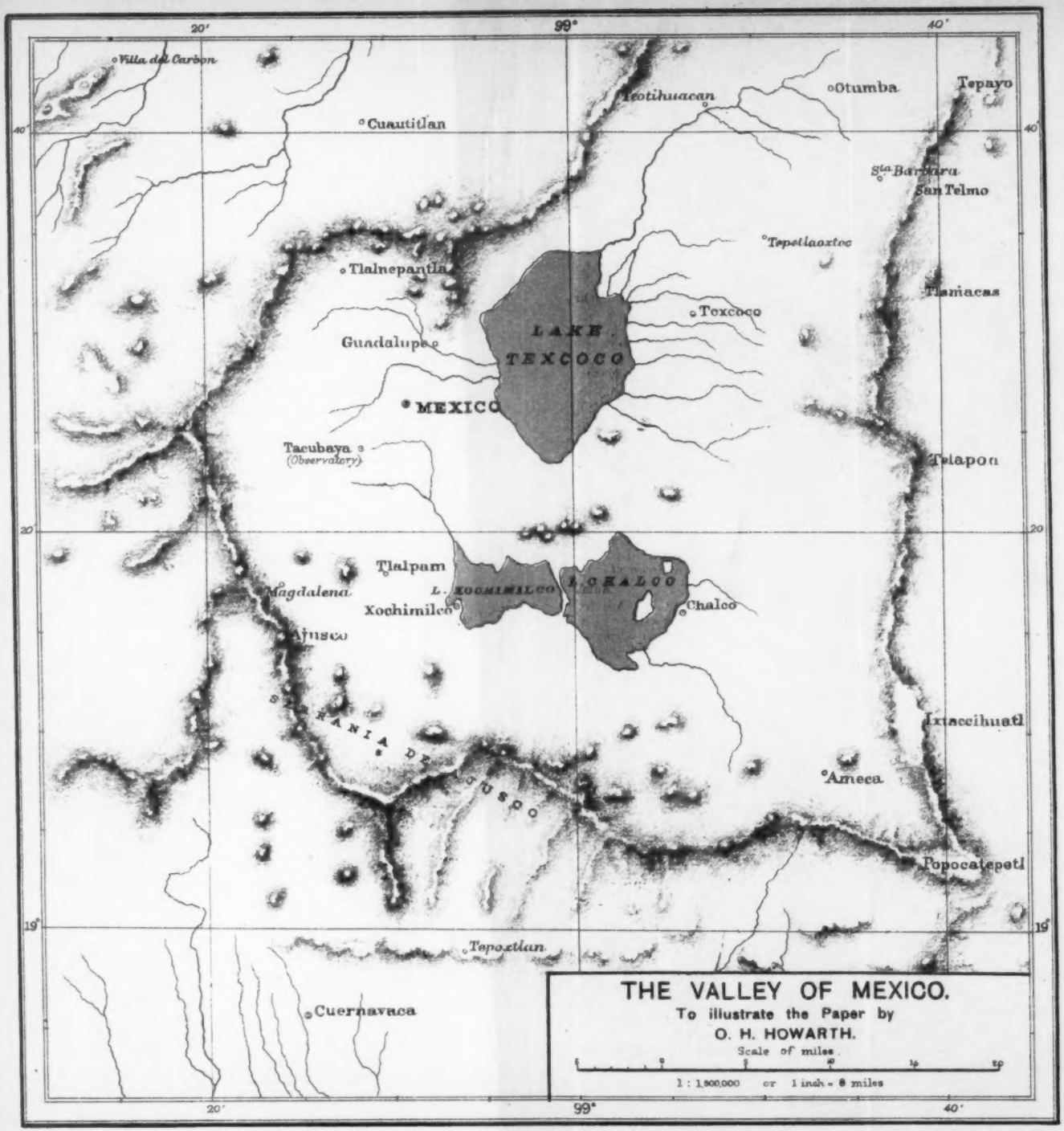
River, perennial stream. *Tug (Torrent bed).*

Spring, Well.

The Author's Route.

Published by the Royal Geographical Society.

George Philip & Son, London & Liverpool.



THE VALLEY OF MEXICO.

To illustrate the Paper by
O. H. HOWARTH.

Scale of miles.

1 : 1,900,000 or 1 inch = 8 miles